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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 50422 - 51422.

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AIR POLLUTION ABSTRACTS

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

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AIR POLLUTION ABSTRACTS

VOLUME 6, NO. 9 SEPTEMBER 1975

Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

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Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

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As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.

Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

Feedback from our users, including suggestions of articles, are always welcome.

APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts, June 1973 GPO No. EP 4.9:125, $0.70.

Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:119, $0.90.

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Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:96, $2.25.

Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:95, $0.50.

Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:94, $0.65.

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Beryllium and Air Pollution: An Annotated Bibliography, February 1971, GPO No. EP 4.9:83, $0.40.

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Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

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COMPILATION OF CDHS STATE ASSISTANCE REPORTS.
Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709

Contract No. 68-02-2109, RFP No. Du-75-A112 .... *$84,798*
EFFECTS OF PARTICLE/LIQUID INTERFACIAL PROPERTIES ON COLLECTION OF FINE PARTICLES BY WET SCRUBBERS.
Meteorology Research, Inc., 464 West Woodbury Road, Altadena, California 91001

Contract No. 68-02-2201, RFP No. Du-75-B136 .... *$35,131*
SOURCE SIMULATOR SUPPORT EQUIPMENT PURCHASE.
Dominion Industries Ltd., 1400 630-6th Avenue, S.W., Calgary, Alberta, Canada T2P OT8

Contract No. 68-02-2206, RFP No. Du-75-B089 .... *$98,515*
DEVELOPMENT OF CONTINUOUS MONITOR FOR MEASUREMENT OF MASS CONCENTRATIONS OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES.
Aeronutronic Ford Corporation, Aeronutronic Division, Ford Road, Newport Beach, California 92663

Contract No. 68-02-2210, RFP No. Du-75-B132 .... *$64,945*
STUDY OF COMPARATIVE CHARACTERIZATION OF ALVEOLAR MACROPHAGES OF PRIMATES AND OTHER EXPERIMENTAL ANIMALS.
Southwest Foundation for Research and Education, P. O. Box 28147, San Antonio, Texas 78284

Contract No. 68-02-2058, RFP No. Du-75-C180 .... *$26,798*
THE ENVIRONMENTAL PROTECTION IS SEEKING A CONTRACTOR TO DEVELOP A PLAN TO DEFINE THE AREA FOR WHICH A MONITORING SITE IS REPRESENTATIVE.
Rockwell International, P. O. Box 1085, 1049 Camino Dos Rios, Thousand Oaks, California 91360

Contract No. 68-02-2104, RFP No. Du-74-A178 .... *$137,612*
DEVELOPMENT OF A HIGH TEMPERATURE ELECTROSTATIC PRECIPITATOR.
Cottrell Environmental Sciences, Inc., Box 750, Bound Brook, New Jersey 08805

Contract No. 68-02-2234, RFP No. Du-75-B070 .... *$56,670*
DEVELOP A PORTABLE DEVICE FOR COLLECTION OF SULFURIC ACID.
Southern Research Institute, 2000 Ninth Avenue, South, Birmingham, Alabama 35205

Contract No. 68-02-2112, RFP No. Du-75-A070 .... *$154,400*
RESEARCH ON FUEL CONTAMINANT REMOVAL.
Battelle Memorial Institute, Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201

Contract No. 68-02-2226, RFP No. Du-75-B106 .... *$35,523*
FIELD EVALUATION OF AUTOISOKINETIC SAMPLING SYSTEM.
Entropy Environmentalists, Inc., P. O. Box 12291, Research Triangle Park, North Carolina 27709

Contract No. 68-02-2111, RFP No. Du-75-A236 .... *$99,300*
INSTRUMENTAL MEASUREMENT OF LIQUID DROPLET SIZE DISTRIBUTION FOR DEMISTER EVALUATION.
KLD Associates, Inc., Suite 204, 7 High Street, Huntington, New York 11743 (NOTE: Contract contains options in the amount of $147,915)

Contract No. 68-02-1410, Modification No. 3 .... *$27,561*
PROVIDE NECESSARY MODIFICATION TO THE NATIONAL EMISSIONS DATA SYSTEM (NEDS) AREA SOURCE LIQUID FUEL PROGRAM.
Walden Research Division of Abcor, Inc., 201 Vassar Street, Cambridge, Massachusetts 02139

Contract No. 68-02-2101, RFP No. Du-74-X160 .... *$220,617*
ENVIRONMENTAL STUDIES WITH REGARD TO THE UTILIZATION OF WASTES AS FOSSIL ENERGY SUBSTITUTES.
The Ralph M. Parsons Company, 100 West Walnut, Pasadena, California 91124

Contract No. 68-02-2250, RFP No. Du-75-B214 .... *$68,761.70*
LABORATORY RESEARCH ANIMALS.
Charles River Breeding Labs, Inc., 251 Ballardvale St., Wilmington, Massachusetts 01887

Contract No. 68-02-2062, RFP No. Du-75-C184 .... *$165,082*
AIR POLLUTION CONTROL ENGINEERING AND COST STUDY OF THE MOTOR VEHICLE SURFACE COATING INDUSTRY.
DeBell and Richardson, Inc., Water Street and Hazardville, Enfield, Connecticut 06082

Contract No. 68-02-1773, RFP No. Du-75-B142 .... *$29,987*
DESIGN, DELIVERY AND INSTALLATION OF PORTABLE CLEAN ROOMS FOR USE IN ISOLATION OF EXPERIMENTAL ANIMALS.
BioClean, 5 Union Hill Road, West Conshohocken, Pennsylvania 19428

Contract No. 68-02-2225, RFP No. Du-75-B105 .... *$52,417*
DEVELOPMENT OF INSTRUMENTATION FOR MEASURING THE OPACITY OF PARTICULATE POLLUTANTS IN STACKS CONTAINING CONDENSED WATER.
Interpoll, Inc., 1996 West County Road C, St. Paul, Minnesota 55113

Contract No. 68-02-2235, RFP No. Du-75-B130 .... *$56,030*
EVALUATION OF COLLECTION MEDIA FOR LOW LEVELS OF AIRBORNE PESTICIDES.
Southwest Research Institute, 8500 Culebra Road, San Antonio, Texas 78284

Contract No. 68-02-2240, RFP No. Du-75-B083 .... *$59,997*
STUDY OF AEROSOL FORMATION AS A FUNCTION OF REACTANT CONCENTRATION.
Battelle Memorial Institute, Columbus Laboratory, 505 King Avenue, Columbus, Ohio 43201

Contract No. 68-02-2217, RFP No. Du-75-B150 .... *$79,947*
EVALUATION OF NEUROPHYSIOLOGIC FUNCTION IN CHILDREN WITH 'ASYMPTOMATIC' LEAD BURDENS.
The Children's Hospital Medical Center, 300 Longwood Avenue, Boston, Massachusetts 02115

Contract No. 68-02-2218, RFP No. Du-75-B103 .... *$43,788*
DEVELOPMENT OF COMPLIANCE TEST AND MONITORING METHODOLOGY FOR SOURCE EMISSION MEASUREMENT OF CHLORINATED HYDROCARBONS.
Beckman Instruments, Inc., 1630 South State College Boulevard, Anaheim, California 92806 (NOTE: Contract contains options in the amount of $43,758)

Contract No. 68-02-1567, Modification No. 9 .... *$142,659*
ADDITIONAL TECHNICAL SUPPORT SERVICES FOR OPERATION AND MAINTENANCE OF EPA TECHNICAL LABORATORIES AT RESEARCH TRIANGLE PARK, NORTH CAROLINA.
Northrop Services, Inc., P. O. Box 1484, Huntsville, Alabama 35807

Contract No. 68-02-1567, Modification No. 8 .... *$195,624*
ADDITIONAL LEVEL OF EFFORT OF APPROXIMATELY 19,500 MAN-HOURS FOR TECHNICAL SUPPORT SERVICES OF RESEARCH LABORATORIES AT NERC, RESEARCH TRIANGLE PARK, NORTH CAROLINA.
Northrop Services, Inc., P. O. Box 1484, Huntsville, Alabama 35807

Contract No. 68-02-2054, RFP No. Du-75-C128 .... *$109,800*
DOCUMENTATION REVISIONS MODIFICATIONS AND EXTENSIONS TO THE COMPREHENSIVE DATA HANDLING SYSTEM SUBSYSTEMS, AIR QUALITY DATA HANDLING SYSTEM II AND EMISSION INVENTORY SUBSYSTEM/PERMITS AND REGULATIONS.
IBM Corporation, 18100 Frederick Pike, Gaithersburg, Maryland 20760 (NOTE: Contract contains options in the amount of $109,000)

Contract No. 68-02-1783, RFP No. Du-75-B078 .... *$133,150*
DEVELOPMENT OF OPEN-PATH AMBIENT AIR MONITOR USING CO2 LASER RADIATION.
General Electric Company, Electronics Laboratory, Electronics Park, Syracuse, New York 13201

Contract No. 68-02-2110, RFP No. Du-75-A235 .... *$59,500*
DEVELOPMENT OF SAMPLING PROCEDURES - FUGITIVE EMISSION RATE (PARTICULATE AND GASEOUS).
TRC, The Research Corporation of New England, 125 Silas Deane Highway, Wethersfield, Connecticut 06109

Contract No. 68-02-2227, RFP No. Du-75-B117 .... *$140,000*
VARIATION IN BODY BURDEN MEASUREMENTS OF LEAD IN FAMILIES.
Southwest Research Institute, 8500 Culebra Road, San Antonio, Texas 78284 (NOTE: Contract contains options in the amount of $11,220).

Contract No. 68-02-2241, RFP No. Du-75-B087 .... *$99,750*
STUDY TO DETERMINE THE FATE OF NOx IN THE ATMOSPHERE AND STUDY THE TRANSPORT OF OXIDANT BEYOND URBAN AREAS.
Battelle Memorial Institute, Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201

Contract No. 68-02-2251, RFP No. Du-75-B019 .... *$146,850*
STUDY AND EVALUATION OF ELECTRON MICROSCOPE METHODS FOR MEASUREMENT OF AIRBORNE ASBESTOS CONCENTRATIONS AND EVOLVEMENT OF AN OPTIMAL PROCEDURE.
IIT Research Institute, 10 West 35th Street, Chicago, Illinois 60616

Contract No. 68-02-1715, Modification No. 2 .... *$153,986*
TOXICOLOGICAL EVALUATION OF MATERIALS FOUND AS IMPURITIES IN TECHNICAL PREPARATIONS OF PESTICIDES AND OF MATERIALS DESIGNATED AS SUBSTITUTE CHEMICALS FROM CURRENTLY REGISTERED PESTICIDES.
Battelle Memorial Institute, 505 King Avenue, Columbus, Ohio 43201

Contract No. 68-02-1706, Modification No. 2 .... *$29,841*
EXTENSION OF MULTIRESIDUE METHODOLOGY.
University of Florida, Gainesville, Florida 32601

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries, secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants, laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1975

50422 **APTIC NO. 73475**

Bouscaren, R.

FORECAST OF THE EMISSION OF POLLUTANTS THROUGH COMBUSTION UP TILL 1985. *(Prevision des emissions de polluants par les combustions jusqu en 1985). Text in French. Centre Interprofessionel Technique d Etude de la Pollution Atmospherique, Paris (France), Etudes Documentaires, no. 45(CI 865), 7p., 1975.*

A forecast of the particulate and sulfur dioxide emissions in France until 1985 is presented. The forecast is based upon existing and envisaged regulations, the expected fuel consumption, and the reduction of the sulfur content in domestic fuel oil to 0.3% by 1978. Reduction of the sulfur content in heavy fuel oil is also envisaged. The dust emission is expected to decrease by 45% from 1975 to 1980, and by 60% from 1975 to 1985. The SO2 emission is predicted to decrease by about 10% from 1975 to 1980, and by 25% from 1975 to 1985. The abatement in the dust emission will be lowest from domestic and other small-capacity firing. The provisions are lower than earlier forecasts, which is mainly due to the lower fuel consumption as compared with figures in earlier forecasts.

50423 **APTIC NO. 70673**

Broome, D.

ECONOMY FROM THE TRUCK DIESEL ENGINE. *Transport Eng. (London), 1975:13-15, Jan. 1975.*

For any given truck, the engine/transmission match and the way in which the truck is driven can affect fuel economy. The major yardstick is the engine s brake specific fuel consumption -- the ratio of the energy supplied in the fuel to the useful energy output at the flywheel. This will vary over the load and speed of the engine. The brake specific fuel consumption is discussed for medium and large sized four-stroke truck engines, universally fitted with a direct injection combustion system, naturally aspirated or turbocharged. Although significant differences in the brake economy of existing truck diesel engines occur, they can always be explained by careful testing and analysis of results. The production of the most economical engine will involve compromises with durability and other aspects of performance. With the changing market requirements brought about by the increasing cost of fuel, some readjustment of factors should be assessed in new designs. The combustion effects and mechanical efficiency must be considered to develop efficient engines. Improvement in efficiency to decrease fuel consumption will sometimes also reduce pollutant emissions.

50424 **APTIC NO. 73030**

Creswick, Frederick A., Ellsworth R. Blosser, David A. Trayser, and John F. Foster

SULFURIC ACID EMISSIONS FROM AN OXIDATION-CATALYST EQUIPPED VEHICLE. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 11p., 1975. 15 refs. (Presented at the Society of Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750411.)*

A 1973 Ford Torino with 1975 emission controls which included a monolithic noble metal oxidation catalyst was used to examine the effects of vehicle operating variables on sulfuric acid exhaust emissions. The vehicle was operated with and without the catalyst at a steady 60 mph and over the 1975 Federal Test cycle. Sulfuric acid emissions at 60 mph accounted for 36% of the fuel sulfur, whereas on the 1975 Federal Test cycle the figure varied between 10 and 24%, depending on prior operating history. Small differences were also noted between cold and hot start and between transient and stabilized phases of the cycle. Sulfur storage in the converter was minor. The emitted H2SO4 was composed primarily of droplets smaller than 0.3 micron. Sulfuric acid emissions were less than 1% of the fuel sulfur without the catalyst. (Author abstract modified)

50425 **APTIC NO. 73473**

Detrie, J. P.

STUDY OF THE EVOLUTION OF POLLUTION DUE TO COMBUSTION IN FRANCE IN 1972-1973-1974. *(Etude de l evolution de la pollution due a la combustion en France en 1972-73-74). Text in French. Centre Interprofessionnel Technique d Etude de la Pollution Atmospheric Paris (France) Etudes Documentaires, no. 45(871): 11p., 1975.*

The evolution of black smoke and sulfur dioxide concentrations due to combustion in France during the 1972-1974 period is surveyed. Both the black smoke and SO2 concentrations have decreased in all towns during the investigation period, with the respective rates of decrease being 15% for black smoke, and 20% for SO2. The improvement is due to clean air maintenance measures, such as a reduction of the sulfur content in fuel oil, an improvement of combustion equipment, the erection of high stacks, and the assignment of special protection zones. The increase in the emissions from high stacks did not markedly influence the abatement of the pollutant concentrations. Further abatement in the pollution levels is expected for the 1980-1985 period.

50426 **APTIC NO. 73474**

Detrie, J. P. and R. Bouscaren

CONSUMPTION OF ENERGY FOR THE PREVENTION OF ATMOSPHERIC POLLUTION. *(Consommation d energie pour la prevention de la pollution atmospherique). Text in French. Centre Interprofessionnel Technique de Etude de la Pollution Atmospherique, Paris (France), Etudes Documentaires, no. 45(867): 12p., 1975.*

Estimations of energy consumption in French industry for air pollution control, such as flue gas cleaning by means of scrubbers, bag filters, electrostatic precipitators, thermal or catalytic afterburning, fuel oil desulfurization, and mechanical dust separation are presented. The overall energy consumption for air pollution abatement amounts to 0.5% of the total energy generation in 1973. To keep the energy consumption for air pollution abatement within reasonable limits as it is presently the requirements on air pollution control must remain reasonable, since the maximum possible degree of pollution abatement would lead to a sharp increase in the energy consumption.

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50427 ***APTIC NO. 70520***

Dittrich, Walter

PRACTICAL EXPERIENCE WITH MEASUREMENT OF DIESEL ENGINE SMOKE PURSUANT TO ECE-R 24. (Praktische Erfahrungen bei der Messung von Dieselmotorenrauch nach ECE-R 24). Text in German. Automobiltech. Z. (Stuttgart), 77(1):4-9, 1975. 4 refs.

Since the ECE regulation 24 demands that diesel smoke of automobiles be measured with opacimeters or units yielding equivalent results, the smoke density of diesel engines was measured with opacimeters and filter units for comparison. Conversion tables, comparative curves, and calculations are provided permitting the conversion of grey tones into opacity units with an accuracy sufficient for practical use. The correlation of measurements obtained with the filters and opacimeters was studied during operation at constant full load and at free acceleration. A relationship could be found in most cases; however, it provided no basis for setting up correlations. Finally, smoke characteristics of induction diesel engines were compared with supercharged engines at different geographical altitudes, based upon practical road tests in the Grossglockner mountains. A linear smoke increase with increasing altitude or decreasing air density was observed.

50428 **APTIC NO. 70551**

Hardenberg, Horst

STUDIES ON COMPRESSION IGNITION KNOCK AND SMOKE CHARACTERISTICS OF FUELS. *(Untersuchungen ueber das Selbstentzuendungs-Klopf-und Rauchverhalten von Kraftstoffen). Text in German. Motortechnische Zeit. (Motor Engineering Times), 36(1):10-16, 1975. 15 refs.*

The suitability of fuels for compression ignition engines depends on their ignition characteristics and production of black smoke and odorous compounds. A description of fuel requirements in this regard is given. Since there are two kinds of knock, end gas and pressure rise, the anti-knock characteristics of fuels can be described by two types of code numbers only. The present octane numbers are sufficient for the description of end gas knock resistance. For the description of pressure rise knock resistance, the approach of the ignition delay measurement might be usable for the same fuel in a compression ignition engine. The anti-knock characteristics can be defined much more precisely with the aid of the ignition delay measurement than by octane numbers. The cetane ratings determined in a test engine can be used to describe the readiness of fuel ignition in a practical engine only under certain conditions. Since aromatics require a greater amount of air excess for smoke-free combustion than pure paraffinic fuel components, fuels used in compression ignition engines should be free from aromatics or have at least a very small aromatic content, because aromatics lower the cetane number. Mass spectrograms would provide information about the molecular stability of all fuel components and the ignition and combustion characteristics of fuel components which could not otherwise be tested because of their insufficient quantity.

50429 **APTIC NO. 70378**

Hochdahl, O.

FIRST OPERATING RESULTS OF A 3300 TONS/DAY PRODUCTION LINE WITH LEPOL KILN AT THE LAEGERDORF PLANT. *(Erste Betriebsergebnisse einer 3300-t/d-Produktionslinie mit Lepolofen im Werk Laegerdorf). Text in German. Zement-Kalk-Gips (Wiesbaden), 28(1):18-28, Jan. 1975. 1 ref.*

Experience gained in the operation of a 3300 tons/day plant with the world's largest Lepol kiln at the Laegerdorf cement works over a period of 1 yr is reported. The soft raw materials, with a substantial natural moisture content, are efficiently excavated with chain bucket excavators and economically prepared by the wet process. The narrow range of variation in the chemical composition of the raw materials offers ideal conditions for good cement quality. The high water content of the raw slurry is reduced to half by filtration in chamber filter presses, so that the material can be further processed in a grate preheater kiln with heat consumption of 900 kcal/kg of clinker. The first Lepol kiln has been in service for 14 mo, during which period it has performed satisfactorily.

50430 **APTIC NO. 70670**

Lea, K. E.

COMMERCIAL VEHICLE FUEL ECONOMY -- ARE ADVANCES POSSIBLE? *Transport Eng. (London), 1975:17-19, Jan. 1975.*

Possible advances in commercial vehicle fuel economy are discussed on the basis of payload ton mi/gal. Factors affecting vehicle choice include vehicle type, continuous optimum load size, average speed requirement to cover hours driven and route length, payload/tare weight ratio, engine type, power weight ratio, cab size and drag resistance, transmission type, tires, and auxiliaries parasitics. The following operating factors can effect fuel economy: truck size, power and speed demanded by rolling resistance, power/weight optimum (32 ton), tare weight, engine characteristics, thermal efficiency, mechanical efficiency, and transmission effects. The use of the turbocharge direct injection diesels in four-stroke forms will continue to be used in the future as the machine of highest thermal efficiency. The engine is capable of good economy when properly developed and matched against the transmission standards for the type of vehicle operation. The turbocharged engine tends to move with the environmental demands of noise and smoke control, and, for trucks in the range of 12-ton GVW upwards, perhaps provides the only possible future. Fuel savings of 4% can be achieved by control of maximum road speed at 50 mi/hr, savings of 5% by power/weight ratios of 7.0-8.5 bhp/ton and turbocharged DI engines, 2% by reduction of mechanical losses, and 5% by transmission effects. Demands for invisible emission controls will have to be weighed against any deterioration in fuel economy. (Author conclusions modified)

50431 **APTIC NO. 73146**

Moy, H. C., L. A. Cohen, P. S. Ku, and J. J. Szeligowski

ENVIRONMENTAL CONSIDERATIONS OF ALTERNATE CLOSED-CYCLE COOLING SYSTEMS. *Preprint, American Inst. of Chemical Engineers, New York, 19p., 1975. 10 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 79th, Houston, Tex., March 16-20, 1975, Paper 28c.)*

The environmental impacts of natural and mechanical draft cooling towers were assessed for an existing nuclear power facility using a once-through cooling system. Mechanical draft cooling towers appeared to be less desirable than natural draft cooling towers due to the former's potential for fogging, icing, botanical injury from saline deposition, and noise emissions. Induced fogging from natural draft towers was estimated at 1 hr/yr as compared to 82 hr/yr for mechanical draft towers. Natural draft cooling towers were estimated to result in no induced icing as compared to a figure of of 97 hr/yr for mechanical draft towers. Botanical effects due to saline drift, in acreage of potential injury, were estimated at 9 for natural draft towers and 199 for mechanical draft towers. Atmospheric discharge from make-up generation over the entire service life amounted to 480 tons/yr of sulfur oxides, 630 tons/yr of nitrogen oxides, and 180 tons/yr of particulates for natural draft towers as opposed to 730, 960, and 274 tons/yr, respectively, for mechanical draft towers.

50432 **APTIC NO. 70385**

Mueller, Heinz-Wolfgang

DESIGN OF THE HIGH TEMPERATURE REACTOR WITH REGARD TO ASPECTS OF ENVIRONMENTAL POLLUTION AND LICENSING. *(Die Baulinie des Hochtemperaturreaktors unter Umwelt-und Genehmigungsaspekten). Text in German. Elektrotech. Z. A, 96(1):12-18, 1975. 4 refs.*

Nuclear power plants with high temperature reactors meet the demands for low thermal and radioactive pollution of the environment. They reach a degree of efficiency of 40% compared to only 33% of the light water reactor. Thus about 25% less waste heat is emitted. The single circuit high temperature reactor offers high temperature waste heat which favors the application of the dry cooling process. The cooling tower can be much smaller than for a light water reactor. The use of this waste heat for power generation and remote heating is becoming increasingly popular. All the advantages of the high temperature reactor make it easier to select a site and to speed up licensing.

50433 **APTIC NO. 73004**

Rado, William G. and Wayne J. Johnson

SIGNIFICANCE OF BURN TYPES, AS MEASURED BY USING THE SPARK PLUGS AS IONIZATION PROBES, WITH RESPECT TO THE HYDROCARBON EMISSION LEVELS IN S.I. ENGINES. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 9p., 1975. 1 ref. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750354.)*

The significance of burn types on hydrocarbon emissions from spark ignition engines was investigated by analyzing combustion signals with the utilization of spark plugs as ionization probes. A correlation between the simultaneously recorded combustion and cylinder pressure signals allowed for the use of combustion signals to identify three types of burns, viz., good burns, slow burns, and misfires. During both deceleration and operation with exhaust gas recirculation, degradation from good burns followed the same pattern irrespective of engine type tested. Good burns gradually turned into slow burns and then into misfires as deceleration became more severe or as the EGR rate was increased. Slow burns resulted in 3-13 times the hydrocarbons that resulted from good burns, and misfires increased hydrocarbon levels 18-24 times those resulting from good burns. About 60% of the unburned fuel leaving the engine cylinder appeared to be burned up in part of the exhaust manifold (Author abstract modified)

50434 **APTIC NO. 73035**

Weiner, Steven A.

AN OVERVIEW OF THE SODIUM-SULFUR BATTERY. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 9p., 1975. 5 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750149.)*

The current status of work on a sodium-sulfur battery is reviewed, with particular emphasis on the ceramic electrolyte and materials for the sulfur electrode. Research on new compositions of ceramic electrolyte and new processing methods suggests that beta-beta- alumina conductive ceramic membranes may be manufactured economically. The search for acceptable materials to contain the sulfur electrode and/or back the porous graphite felt is continuing; and, whereas no materials are yet identified which do not corrode, several metal compounds show promise as conductive protective coatings. Sodium-sulfur cells capable of operating reproducibly without deterioration after hundreds of cycles are presently available. Metallic impurities do not have a severely degrading effect on the conductive ceramic membrane. Thus, no fundamental obstacles are known which preclude the commercial development of the sodium-sulfur battery.

50435 **APTIC NO. 72994**

Coordinating Research Council, Inc., New York, Nitric Oxide and Carbon Monoxide Measurement Subpanel

COOPERATIVE EVALUATION OF TECHNIQUES FOR MEASURING NITRIC OXIDE AND CARBON MONOXIDE IN DIESEL EXHAUST. PHASE IV. TEST RESULTS. *Proj. CAPI-1-64, Rept. CRC 472, 64p., Jan. 1975. 5 refs.*

Techniques for measuring nitric oxide and carbon monoxide in diesel exhaust were cooperatively evaluated by distributing a 6-cylinder diesel engine to 14 participants who measured the emissions at low-, medium-, and high-power operating conditions with no restrictions on the type of equipment used. The results were also compared with earlier cooperative tests (Phase III) which involved simultaneous measurement of emissions. In general the results were disappointing especially in comparison with the Phase III results. Nitric oxide data obtained by chemiluminescence analyzers were more scattered and significantly lower than data obtained by the more standard non-dispersive infrared method. The range from average for the CO measurements between different laboratories varied from 19-76%, depending on the engine operation mode; and the standard deviation varied from 5.6-24%. The range from average for the NO data obtained by the 15 participants varied from 27-49%, and the standard deviation was 7.9-16%.

50436 **APTIC NO. 73029**

ENVIRONMENTAL EFFECTS OF COOLING TOWER DRIFT. *In: Environmental Sciences Division Annual Progress Report, Oak Ridge National Lab., Tenn., Environmental Sciences Div., Rept. 653, UC-48, p. 91-93, March 1975. 11 refs.*

NTIS: ORNL-5016

Drift deposition and chromium accumulation in vegetation and animals resulting from the release of the metal from cooling towers were investigated at two contrasting locations, Oak Ridge, Tennessee and Paducah, Kentucky. A correlation of 0.99 was obtained between estimated deposition flux and measured Cr concentration in vegetation for the Oak Ridge area. Deposition flux measurements at Paducah were comparable to values measured at Oak Ridge up to 100 m from the cooling towers; but, beyond that distance, transport of Cr was considerably less than that observed at Oak Ridge. The contrasting fluxes suggested that the flat topography and the meteorology of the Paducah site rapidly dispersed drift, thus resulting in lower concentrations deposited per unit area in the terrestrial environment. Analyses of Cr in the pelt and hair of cotton rats inhabiting areas near cooling towers revealed 10-fold increases in Cr over levels measured in controls.

50437 **APTIC NO. 73131**

Oak Ridge National Lab., Tenn., Environmental Sciences Div.

HEAVY METALS IN A FOREST IMPACTED BY A LEAD MINING-SMELTING INDUSTRY. *In: Environmental Sciences Division Annual Progress Report. Rept. 653, UC-48, p. 94-100, March 1975.*

NTIS: ORNL-5016

Heavy metal emissions from lead sintering and smelting operations in the forested Crooked Creek Watershed area of southeastern Missouri were studied. Baghouse dust characterizations revealed that cadmium and zinc concentrations were higher in smelting dusts than in roasting-sintering dusts. Lead sulfide appeared in dusts from both sources, while lead sulfate and lead oxide appeared only in dusts from the sintering operation. Cadmium concentrations decreased with increasing particle size, whereas lead concentrations were not affected by particle size. The occurrence of high levels of Cd, copper, Pb, and Zn in organic litters of Crooked Creek indicated that this component of the forest may be the most important biological sink for these contaminants. Cadmium was much more soluble in the organic litter layer than Pb; Cd was also more available for vegetative uptake.

50438 **APTIC NO. 73152**

Dept. of the Navy, Port Hueneme, Calif., Navy Environmental Support Office

A FIELD GUIDE TO INVENTORYING ESTIMATING AIR EMISSIONS - REVISED MARCH 1975. *Rept. 20.2-004, 57p., March 1975. 4 refs.*

A field guide for the inventory and estimation of air pollutants emitted from naval base operations is presented. Emissions considered include: carbon monoxide, hydrocarbons, nitrogen oxides, sulfur oxides, and particulates. Emission sources are divided into four classes for mass emission calculation: fuel combustion, fuel handling, fuel storage, and industrial processes. The calculation of emission factors from production and consumption rates and from mass emission estimates is illustrated. Application of these data can provide a basis for decision-making on environmental impact assessments.

1974

50439 **APTIC NO. 70611**

Aoyama, Takahiko, Masato Nakashima, Minoru Onishi, and Zen Nagahiko

ABNORMAL COMBUSTION OF TWO-CYCLE ENGINES FOR MOTORCYCLES. *(Otobaiyo 2 saikuru enjin no ijo nensho). Text in Japanese. Preprint, Society of Automotive Engineers of Japan, p. 433-444, 1974. 4 refs. (Presented at the Society of Automotive Engineers of Japan Meeting, Oct. 15-17, 1974.)*

For the analysis of abnormal combustion in two-cycle engines, a combustion test device connected to mini-computer with a magnetic tape system for supplementary memory was developed. The motorcycle engine was operated under a running resistance load in the abnormal combustion range of 3000-5000 rpm engine frequency; data on engine combustion pressure, bottom dead point pulse, crank pulse, engine noise, and measurement starting signal were recorded. In the engine with surging at partial load and 4000-5000 rpm, preignition and knocking occurred frequently. The degree of surging was related to the variation in average effective pressure and periodicity of variation. In the engine with violent surging, the preignition occurred corresponding to the surging period. The abnormal noise was related to the increasing rate of maximum pressure, and the occurrence of abnormal noise was markedly increased at the increasing rate of maximum pressure above 2.0 kg/sq cm deg. The major cause for abnormal combustion was the inferior exhaust gas flow, and the marked decrease in abnormal combustion could be achieved by the modification in exhaust cylinder. For the evaluation of exhaust gas flow, the JANTE method was effective.

50440 **APTIC NO. 70679**

Ayuzawa, Tadashi, Takaaki Nemoto, Takayuki Ko, and Hsi-hung Hsu

THE AIR-FUEL RATIO OF THE TWO-CYCLE ENGINE IGNITION AND OTHER AREAS AND THE MEASUREMENT OF GAS COMPONENTS. *(Nisaikuru kikan no tenkasen kin o oyobi kyokusho no kongohi to gasu sosei no sokutei). Text in Japanese. Preprint, Society of Automotive Engineers of Japan, p. 373-378, 1974. (Presented at the Society of Automotive Engineers of Japan Meeting, Oct. 15-17, 1974.)*

To determine the distribution of mixing ratio in a combustion chamber, the quantitative analysis method for total hydrocarbons at different locations in a combustion chamber using the multi- cycle continuous gas sampling device and gas chromatography was developed. The measurement device and procedures are described with schematic diagrams and specifications. This method is also applicable to sampling at other locations in engines, such as in exhaust pipes. In the combustion chamber of a two-cycle Schnurle exhaust type engine, the concentrations of gaseous mixture in the vicinity of a cylinder head and at the center of the combustion chamber at ignition time were about the same under normal and stable operational conditions. In the engine with a large amount of residual gas such as in the case of a two-cycle engine, the actual average air/fuel ratio in the combustion chamber tended to be higher in the case of A/F of carburetor set higher than the theoretical A/F value and lower in the case of A/F set lower than the theoretical value. In the normal operational range, the concentration of incompletely oxidized HC after the combustion was about the same as that of four-cycle engines. Consequently, the major portion of HC in exhaust gas of a Schnurle type two-cycle engine under normal operational conditions was considered to be attributable to the blow-by.

50441 **APTIC NO. 70168**

Brookie, Robert H.

INFORMING THE PUBLIC ABOUT VEHICULAR POLLUTION. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 457-465. (Sept. 25-27.)*

The need for informing the public about vehicular air pollution is discussed in terms of disseminating information about Federal, state, and local emission control activities, the manufacturer's role in reducing emissions, and the training of government workers, automotive sales people, technicians, and inspectors in emissions control procedures. A complete ongoing coordinated effort is suggested between government agencies, the news media, automotive manufacturers, and school systems. Government and school systems are seen as appropriate means for leading the effort to provide public information and technical training.

50442 **APTIC NO. 70614**

Calcraft, A. M., R. J. S. Green, and T. S. McRoberts

BURNING OF PLASTICS: PART 1, SMOKE FORMATION. *J. Plastics Inst., 42(161):200-208, Oct. 1974. 37 refs.*

Experiments relating the amount and gaseous composition of smoke to various conditions under which different plastics (polyvinyl chloride, polyester resins, and polystyrenes) are burned are described. Smoke measurements in terms of optical density at maximum obscuration varied with heat flux in a manner dependent on the sample composition. Samples were exposed in nitrogen and air atmospheres in a macro-furnace, with the gas flow rate usually fixed at 20 l/min. The optical density of the smoke was generally higher in nitrogen than in air atmospheres, probably since material which would otherwise contribute to smoke was partially oxidized to carbon monoxide and carbon dioxide in air. The time to reach maximum optical density was longer in nitrogen atmospheres also. Maximum optical density varied considerably with heat flux intensity, passing through a maximum at about 33 kW/sq m for three polyesters and progressively increasing with increasing heat flux for a fourth polyester. Gas chromatography of micropyrolyzed samples of three grades of polyester resin showed that yields of lower-boiling-point components (carbon monoxide, carbon dioxide, methane, ethylene, and acetylene) increased with pyrolysis temperature. Chlorine-containing materials yielded hydrogen chloride. The yields of higher-boiling- point components (benzene, toluene, styrene, and naphthalene) passed through various maxima as the decomposition temperature was increased. The examination of changes in naphthalene and other polycyclic aromatics may provide a link between smoke produced from plastics and soot formation studies of single- component hydrocarbon gases and oxygen.

50443 **APTIC NO. 73478**

Casteran, Lucien, Jeanne Duffaud, Christian Wager, and Claudine Delaunay

OPERATION NITROGEN DIOXIDE *(Operation Dioxyde d azote). Text in French. In: Etudes de pollution atmospherique a Paris et dans les departements peripheriques en 1973. Prefecture de Police, Paris (France), Laboratoire Central, 5p., June 1974.*

Results of systematic nitrogen dioxide concentration measurements carried out in a busy street in Paris in 1973 are presented. The determination was done by the Griess-Saltzman method. The monthly mean was highest with 57 micrograms/cu m in January, followed by 53.4 micrograms/cu m in March, and lowest in August, just as in previous years. The annual mean amounted to 46 micrograms/cu m, which is higher than in previous years as a result of slower traffic.

50444 **APTIC NO. 71165**

Cicerone, R. J. and D. H. Stedman

THE SPACE SHUTTLE AND OTHER ATMOSPHERIC CHLORINE SOURCES. *In: Fluorocarbons - Impact on Health and Environment. 93rd Congress (House of Representatives), Second Session, Rept. H.R. 17577, H.R. 17545, Serial 93-110, p. 266-269, Dec. 11-12, 1974. 20 refs. (Hearings Before the Subcommittee on Public Health and Environment of the Committee on Interstate and Foreign Commerce.)*

GPO

The sources and magnitude of tropospheric chlorine compounds are discussed. The dominant source is the conversion of sea salt aerosol chlorides to hydrogen chloride. Global concentrations of chlorides, in g/yr, were estimated for five sources: sea salts 6 times 10 to the 13th power, 85%; volcanic associate emissions 7 times 10 to the 12th power, 10%; anthropogenic emissions 3.3 times 10 to the 12th power, 5%; major eruptions 2.5 times 10 to the 11th power, 1%; and space shuttle 8 times 10 to the 9th power. The total HCl source was calculated as 7 times 10 to the 13th power g/yr. The space shuttle source is based on 50 missions/yr and 150,000 kgn/launch to be deposited in the troposphere. Man-made contributions result from combustion processes and industrial chemistry. It is estimated that 2.6 times 10 to the 10th power g/yr of chloride compounds are diffused into the stratosphere from the troposphere.

50445 **APTIC NO. 73075**

Early, A. Blakeman

COAL CONVERSION TECHNOLOGY AND SOLID WASTE DISPOSAL: TIME TO TAKE STOCK. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 15-20, Oct. 1974. 12 refs.*

The environmental effects of coal conversion technology are discussed with emphasis on solid waste disposal. Air and water pollution control residuals from the land disposal could rise from the 28 million tons generated in 1971 to 170 million tons in 1985. Control of nitrogen oxide emissions is unlikely to create significant amounts of solid residues, even though relatively large amounts of these pollutants are discharged following combustion. Sulfur residues are produced at approximately a 50% greater dry weight amount than the fly ash normally produced by a conventional coal burning utility. Conventional coal burning processes will generate 51 million ton of ash by 1975, 56 million by 1980, and possibly 72 million by 1975. These volumes will escalate at a time when capacity for landfilling solid waste is declining nationwide. Three bills are pending before Congress that deal with solid waste disposal: The Resources Conservation and Recycling Incentives Act, the Comprehensive Waste Management and Resourcce Recovery Act, and the Energy and Resource Recovery Act of 1973.

50446 **APTIC NO. 70513**

Fukushima, H., Y. Iwasaki, I. Ishiguro, H. Onozuka, T. Yajima, H. Saito, Y. Sekine, and T. Matsubara

A SURVEY ON THE ODOR STRENGTH IN SOME INDUSTRIES. *(Santen hikakushiki nioi-bukuro-ho ni yoru sokutei jisshi rei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):453, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Nov. 6-8, 1974, Chiba, Japan, Paper 304.)*

The three-point comparison system is commonly used for odor measurement at bone-meal plants. To evaluate the applicability of this system to other types of industries and at the same time to measure malodor intensities, odor samples were collected in odor bags at nightsoil treatment, rubber, bone-meal, chemical, printing, food processing, incineration and sewage treatment plants, and animal pens. A total of 28 sources were investigated, mostly during 1973 and 1974. The odor intensities determined by the three-point comparison system were 46-63 for the night soil treatment plant, 34-51 for the rubber regeneration plant, 19-50 for the bone-meal plant, 20-46 for the chemical plant, 15-41 for the printing plant, 26-36 for the food processing plant, 24 for the incinerator, 15 for the sewage treatment plant and 15-25 for the animal pens.

50447 **APTIC NO. 69137**

Gordon, Glen E., Douglas D. Davis, Gerhard W. Israel, Helmut E. Landsberg, Thomas C. O Haver, Stuart W. Staley, and William H. Zoller

STUDY OF THE EMISSIONS FROM MAJOR AIR POLLUTION SOURCES AND THEIR ATMOSPHERIC INTERACTIONS (PROGRESS REPORT). *Maryland Univ., College Park, Md., Dept. of Chemistry and Inst. for Fluid Dynamics and Applied Mathematics, College Park, Md., National Science Foundation Grant GI-36338x, 344p., 1974. 33 refs.*

Atmospheric emissions from several types of major air pollution sources are characterized along with their chemical and physical behavior after release into the atmosphere. Sources studied include: electric power stations, municipal and sewage-sludge incinerators, vehicular tunnels, and airports. Topics investigated include: the use of enrichment factors in the interpretation of particulate composition; diffusion-model predictions of power plant plumes; particulate size distribution studies; source and field sampling studies; studies of the reactions of sulfur dioxide, ozone, and nitrogen oxides emitted from power plants; continental background studies; and laboratory gas-phase kinetics investigations. Comparisons are also made for various measurement techniques including laser probes, cascade impactors, nuclear analytical methods, atomic flame methods, liquid-liquid chromatography, vapor phase material collection, and flow rate calibrations for sampling pumps.

50448 **APTIC NO. 73046**

Grossman, J. W., J. M. Slaminski, and A. Licata

EMISSION DATA AND COMBUSTION CALCULATIONS FOR A GENERAL ELECTRIC PG-5341 GAS TURBINE. *Preprint, Combustion Inst., Pittsburgh, Pa., Western States Section, 39p., 1974. 6 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Pullman, Wash., May 6-7, 1974, Paper WSS/CI 74-5.)*

Emissions data on sulfur dioxide, sulfur trioxide, nitrogen oxides, and particulates, as measured by the Environmental Protection Agency Method 5 and the American Society of Mechanical Engineers PTC-27 method, are reported for a General Electric PG-5341 gas turbine fired with oil. The unit was operated at a high-altitude site (6456 ft) at base loads of 16 and 17 MW. Particulate measurements by the EPA Method 5 (0.007 grains/standard cu ft) were almost twice as high as the ASME PTC-27 values (0.0034 grains/standard cu ft); the high exhaust temperature (800-900 F) was thought to be a factor in the difference. Sulfur dioxide, SO3, and NOx results were consistent and displayed little scatter. The average SO2 and SO3 readings were 22.1 ppm, and NOx measurements averaged 124.3 ppm. Comparisons using a basic combustion analysis to predict particulate and SO2 emissions indicated some difficulties. The predicted particulate level represented a minimum emission level, with the difference between calculated and predicted values being caused by incomplete combustion. The predicted SO2 level was half the measured value. Procedures recommended to avoid these difficulties are the taking of more samples and analysis by several independent laboratories. (Author summary modified)

50449 **APTIC NO. 70750**

Gyakushi, Nobuhiko

ON THE UNIFORMITY OF COMBUSTION GAS COMPOSITION IN THE EXHAUST STROKE IN DIESEL ENGINES. *Bull. JSME (Japan Soc. Mech. Engrs.), 17(114):1629-1636, Dec. 1974. 6 refs.*

The influence of combustion gas composition variation on gas sampling measurements of scavenging efficiency was investigated using two- and four-stroke diesel test engines. Scavenging efficiency measurements were made to within 1 and 2% error for methods involving exhaust sampling and combustion chamber sampling, respectively, during the last period of the expansion stroke under full-load operation. Instantaneous carbon dioxide concentrations varied within 10% of average values during exhaust sampling and did not depend on variations in operating speed or load. Analysis of the carbon dioxide profiles for each test engine at various operationg conditions indicated the suitabilitity of the gas as an index of combustion gas concentration.

50450 **APTIC NO. 70344**

Habashi, F., R. Dugdale, and M. Nagamori

PRODUCTION OF COPPER, IRON AND SULFUR FROM CHALCOPYRITE CONCENTRATE BY REDUCTION. *(Die Gewinnung von Kupfer, Eisen und Schwefel aus Kupferkies-Konzentrat durch Reduktion). Text in German. (Metallwirtsch. Metallmarkt), 28(11):1051-1054, 1974. 5 refs.*

Present treatment of copper sulfide concentrations is based exclusviely on oxidation, liberating sulfur dioxide which either leads to atmospheric pollution or to economical problems if a sulfur recovery is attempted. Another method is the reduction of the sulfide, e. g., with hydrogen, to metallic copper. The reduction of chalcopyrite with hydrogen at 800 C is greatly improved by calcium oxide. The reaction products are separated by leaching with diluted hydrochloric acid through which calcium sulfide and iron can be successfully removed from Cu2S concentrate or from metallic copper. The hydrogen sulfide developing at the leaching process can be oxidized to elemental sulfur according to familiar methods. The hydrogen forming at the oxidation process can be returned to the reduction process; ferrous chloride is recrystallized from the solution and reduced to metallic iron. The HCl forming here can be returned to the leaching process.

50451 **APTIC NO. 70212**

Habelt, W. W. and A. P. Selker

OPERATING PROCEDURES AND PREDICTION FOR NOX CONTROL IN STEAM POWER PLANTS. *Preprint, Combustion Inst., 17p., 1974. 14 refs. (Presented at the Combustion Institute, Central States Section, Madison, Wisc., March 26-27, 1974.)*

The operating practices which influence the formation of nitrogen oxides in utility steam power plants when fired with natural gas, oil, or coal, are discussed. The development of NOx prediction capability via the Zeldovich mechanism and the calculated axial time-temperature history of the combustion products within the furnace is described in detail. Agreement with test data is within plus or minus 15% for both oil or gas firing. The NOx emission data from a number of tangentially fired utility boilers are presented to illustrate the NOx emission levels which can be expected from existing units and the reduction which can be achieved through modifications to operating procedures. (Author abstract)

50452 **APTIC NO. 73078**

Hall, H. J., G. M. Varga, and E. M. Magee

TRACE ELEMENTS AND POTENTIAL POLLUTANT EFFECTS IN FOSSIL FUELS. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFT, p. 35-47, Oct. 1974.*

Trace elements in coal and their potential pollutant effects are discussed. Many elements are present at about 1-100 ppm in all regions, and vary by a factor of 3 or less in the averages for different basins or areas. The usual amount of some 20 trace elements measured is about 5-10 ppm. Boron and fluorine are higher, at about 50 to 200 ppm; mercury is lower, about 0.01 to 0.5 ppm. The volatile hazardous elements show the most need for more data. Some or all of these may be related to mineral deposits (beryllium, fluorine, arsenic, selenium, cadmium, mercury, and lead). The hazard of Hg in power plant emissions, in particular, has been grossly exaggerated. Most elements in coal are very close to their crustal abundance, and are not considered toxic at this level. The question of toxicity must be evaluated in relation to actual amounts. The selection of a completely nonpolluting coal is not possible. For a given amount of ash, coals which are low in any one group of elements must be correspondingly high in others. The definition of nonpolluting depends directly on the decision as to which elements are of concern, and which are not. (Author conclusions modified)

50453 **APTIC NO. 70561**

Hanashima, Masataka

PROBLEMS OF GAS FORMATION AT LAND-FILLED AREAS. *(Umetatechi ni okeru gasu hassei mondai). Text in Japanese. Doboku Gakkai-shi (J. Japan Soc. Civil Engrs.), 59(8):47, Aug. 1974.*

Unlike all other types of problems caused by landfills, such as ground water pollution and proliferation of rats, the formation of gas in landfill areas, and subsequent fire or health hazards and tree damage, do not begin to appear until much later. In Nov. 1973, in a school yard of an elementary school of a city in Japan, methane gas began to be emitted and caused health damages to schoolchildren. The city had an advanced landfill study, but perhaps it rushed too much during the land reclamation program. The area was filled between Nov. 1967 and Dec. 1971 with ordinary urban refuse. The total depth of 22 to 35 m was filled with a multi-layer of 4-5 m of refuse, each layer covered by earth. Immediately after the completion of landfill operation, the school was constructed. Generally, oxygen penetrates to a depth of 3 m, but further than that, anaerobic decompositon without oxygen occurs. This takes place very slowly; initially acidic fermentation, then alkaline fermentation begin. The low class aliphatic acid, a product of an early stage of landfill, degrades into carbonic acid and methane, and suddenly gas begins to increase its formation in the 6-12 mo after the landfill. The amount depends on the amount of organic material in the refuse, but 500 to 700 l of gas is produced from 1 kg of degraded organic material; the ratio of methane is about 50-60%. For these landfill programs, an effective degassing device is desired.

50454 **APTIC NO. 70198**

Harak, A. E., L. Dockter, A. Long, and H. W. Sohns

OIL SHALE RETORTING IN A 150-TON BATCH-TYPE PILOT PLANT. *Laramie Energy Research Center, Laramie, Wyo., Bureau of Mines Rept. of Investigations 7995, 35p., 1974. 8 refs.*

The effects of oxygen content of the retorting gas and the superficial gas velocity of the retorting gas on oil recovery from a column of mine-run oil shale were investigated. Eleven runs are completed, and the results of 10 of these are reported. In one run, the average particle size of the shale was substantially increased to determine its effect on oil yield. Oil recoveries ranged from a low of 39.3 to a high of 65.8 volume-percent of Fischer assay. The percent by volume of carbon monoxide, methane, C2, and higher hydrocarbons in the stack gas is tabulated for the 10 runs. For CO the values range from 0.9 to 3.4, for CH4 the range is 0.3 to 0.9, for C2 s the range is 0.2 to 0.7, and for the higher hydrocarbons the range is 0.1 to 0.4. (Author abstract modified)

50455 **APTIC NO. 73040**

Harkcom, Gary V.

AN ANALYSIS OF THE AIR QUALITY MONITORING PROGRAM IN THE WRIGHT-PATTERSON AIR FORCE BASE VICINITY. *Air Force Inst. of Tech., Wright-Patterson AFB, Ohio, Graduate Education Div., Rept. SLSR 20-74B, 128p., Aug. 1974. 43 refs.*

NTIS, DDC: AD-785 955

The major sources of polluters and corresponding pollutants that are responsible for the air contamination level in the vicinity of Wright-Patterson AFB, Ohio were analyzed and the present air quality monitoring program was evaluated. The analysis included particulates, sulfur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons, and photochemical oxidants under typical meteorological conditions. An additional test was performed for each pollutant on the city of Dayton, Ohio during simulated inversion air conditions. The analyses attempted to identify major discrepancies between the air monitoring network and the critical air sampling areas identified by this study. The air monitoring network for the Wright-Patterson AFB vicinity is generally adequate with the major exception of the city of Dayton. Dayton is subjected to high concentrations of pollutants. A potentially serious health hazard could develop without public awareness due to an inadequate air monitoring system. (Author abstract modified)

50456 **APTIC NO. 70197**

Hartstein, Arthur M. and David R. Forshey

COAL MINE COMBUSTION PRODUCTS NEOPRENES, POLYVINYL CHLORIDE COMPOSITIONS, URETHANE FOAM, AND WOOD. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Mining and Safety Research Center, and Bureau of Mines, Washington, D. C., Office of Assistant Director-Mining, Bureau of Mines Rept. of Investigation 7977, 29p., 1974. 3 refs.*

Gram per gram data of products formed on thermal oxidative degradation of selected compositions, both under dynamic and static conditions were obtained. Four broad classes of materials were studied: polyvinyl chloride compositions, neoprene compositions, rigid urethane foams and variously treated woods. Thermogravimetric and differential thermal analyses were performed to gain understanding of the processes occurring and to explore the feasibility of using these analyses as a method of material identification. The toxic products detected and quantitated included hydrogen chloride, hydrogen sulfide, carbon monoxide, sulfur dioxide, carbon disulfide, carbonyl sulfide, formic acid, acetic acid, formaldehyde, acrolein, benzene, chloroprene, chlorethanol, benzyl chloride, aniline, and furfural. (Author abstract modified)

50457 **APTIC NO. 73067**

Henderson, C. D. and S. H. Dowdell

TEST PROGRAM ON ENVIRONMENTAL EFFECTS OF SALTWATER MECHANICAL COOLING DEVICES. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 501-508, 1975. 3 refs. (March 4-6.)*

A test program being conducted by the Environmental Protection Agency and the Florida Power and Light Company to determine the environmental effects of a salt water mechanical draft cooling tower and two powered spray modules is described. The program is designed to provide data on the drift emission properties of the cooling devices, ambient air salt concentrations, and the significance of salt contributions from the cooling devices in terms of background levels. Measurements of drift particle size distribution, salt deposition, plume rise, and appropriate meteorological parameters are also being made. Testing is scheduled for completion around August 1974.

50458 **APTIC NO. 72984**

Holy, Z. J.

THE COMPARISON OF THE ENVIRONMENTAL ASPECTS OF NUCLEAR AND FOSSIL FUELED POWER STATIONS. *Preprint, Univ. of New South Wales, Australia, School of Nuclear Engineering, 9p., 1974 (?). 13 refs.*

The environmental effects of nuclear versus fossil fuel power stations are reviewed, with particular reference to the country of Australia. Overall, nuclear stations appear to pose less of an environmental threat than fossil fuel stations, particularly in terms of air pollution. Emissions of sulfur oxides, hydrocarbons, carbon monoxide, nitrogen oxides, particulates and other combustion products associated with thermal plants are nonexistent with nuclear plants. Although nuclear plants are generally less thermally efficient than fossil fuel plants, the former contribute less to thermal atmospheric pollution. During normal operation the discharge of radioactive gases and liquids from nuclear plants is minimal. Radioactivity is produced in the reactor by two processes: fission of fuel atoms resulting in the production of radioactive fission products and neutron activation of core, coolant, and core structural materials. The current approach to the disposal of tritium gas, tritiated water vapor, and krypton-85 in Australia is to release them into the atmosphere in order to dilute them. Although this method is acceptable at present because exposure levels are negligible, such releases must eventually be contained.

50459 **APTIC NO. 70308**

Hoshika, Y., S. Kadowaki, I. Kojima, K. Koike, and K. Yoshimoto

THE GAS CHROMATOGRAPHIC ANALYSIS OF SULFUR COMPOUNDS IN THE EXHAUST GAS FROM A KRAFT PULP MILL AND ITS APPRAISAL. *(Kurafuto parupu kojo kara haishutsu sareru io kagobutsu no gasu kuromatogurafu bunseki to sono hyoka). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):460, Nov. 1974. 2 refs. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 311.)*

Odorous substances in the exhaust from a kraft pulp mill (treatment capacity, 640,000 tons/yr) were collected in a cold trap and analyzed by gas chromatography. Methyl mercaptan was found to be the major component, followed by dimethyl sulfide.

50460 **APTIC NO. 73042**

Irani, M. C., P. W. Jeran, and Maurice Deul

METHANE EMISSION FROM U. S. COAL MINES IN 1973, A SURVEY. A SUPPLEMENT TO IC 8558. *Bureau of Mines Information Circ., 8659, 50p., 1974. 9 refs.*

The emission of methane from U. S. coal mines was surveyed for 1973. Total daily emissions declined from 227 MM cu ft in 1971 to 214.7 MM cu ft in 1973. The highest average daily emissions in million cu ft/day observed in U. S. bituminous coal mines were, in decreasing order, Monongalia County, W. Va., 40.7; Marion County, W. Va., 23.1; Buchanan County, Va., 22.1; Washington County, Pa., 12.4; Green County, Pa., 11.7; McDowell County, W. Va., 11.4; Cambria County, Pa., 9.8; Jefferson County, Ala., 9.5; Wyoming County, W. Va., 6.0; Marshall County, W. Va., 4.8; and Indiana County, Pa., 4.8. (Author abstract modified)

50461 **APTIC NO. 70604**

Ishizuka, Y. and A. Kaneda

DTA CURVE OF AUTOMOTIVE EXHAUST DEPOSIT IN EXHAUST PIPE AND ITS WATER SOLUBLE COMPONENTS BY FUEL TYPES. *(Nenryo betsu, jidosha haikiko taiseki butsu no DTA kyokusen oyobi sono ganyu suiyosei seibun ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):478, Nov. 1974.*

(Presented at the 15th National Air Pollution Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 326.)

The composition of automotive exhaust gas varies with fuel type, engine structure, and driving conditions. Using four types of fuels, gasoline, mixed gasoline, liquefied petroleum gas, and light oil, the Differential Thermal Analysis (DTA) curve of deposits in the exhaust pipe was measured. A manual DTA device in the temperature range of 0-700 C showed two peaks. The comparative integral values of calorific values by setting LPG as 1.00 were 0.95 for gasoline, 0.94 for mixed gasoline, and 0.79 for light oil, indicating that the hydrocarbon content in LPG was the highest. The water soluble components SO4(--), NO3(-), CL(-), NH4 in the deposits and in atmospheric suspended particulates were measured by absorption spectroscopy. The light oil with a low HC pollutant concentration showed high SO4(--) and CL(-) concentrations. The composition of deposit was similar to the estimated exhaust gas composition based on fuel composition.

50462 **APTIC NO. 70681**

Itano, Yoshitaro, Masaharu Kawata, and Kinya Yoda

HEATING DUST COLLECTION PROCESS AND CONDENSED EMISSION OF HEAVY METALS. *(Kanetsu shujin kotei to jukinzoku no noshuku haishutsu). Text in Japanese. Kagaku (Science), 44(8):487-494, Aug. 1974. 37 refs.*

Volatile heavy metals such as cadmium, lead, and zinc are emitted from a cement factory. The concentrations of these heavy metals in raw materials are relatively low; the metals are volatized during the calcination, adsorbed, and concentrated on the microparticles before the emission. The Cd, Pb and Zn concentrations in the dust accumulated on roofs and rain gutters in the area surrounding the Onoda Cement Fujiwara Factory were as high as 30-50 ppm, 800-1500 ppm and 800-2500 ppm, respectively. The result of soil analysis showed a maximum concentration of 7.9 ppm for Cd, 420 ppm for Pb, and 334 ppm for Zn; the area with a Cd concentration higher than 2 ppm and Pb higher than 100 ppm extended 1 km to the east and west and 5 km to the north and south. The concentrations of Cd, Pb, Zn, and copper in limestones collected at six locations were in the range of 0.2-1.7 ppm, 0.1-6.1 ppm, 4.1-12.9 ppm, and 0.3-6.3 ppm, respectively. The Cd concentration of 35 rice samples were in the range of 0.02-1.03 ppm. Data are given with diagrams showing geographical locations of sampling. The problems involved in the measurement method are discussed. The concentration mechanism of heavy metals on dust particles in the calcination process are described. The dust particles emitted from the kiln are collected by the electrostatic precipitator with 99.5% collection efficiency; however, the collection efficiency for particles less than 1 micron is 70-80%.

50463 **APTIC NO. 73483**

Jacquinot, Pierre

OPERATION INDOOR AIR POLLUTION. *(Operation Pollution interieure des locaux). Text in French. In: Etudes de pollution atmospherique a Paris et dans les departements peripheriques en 1973. Prefecture de Police, Paris (France), Laboratoire Central, 5p., June 1974.*

Possibilities and cases of indoor air pollution and its internal and external sources are analyzed. Poisonings with carbon monoxide were mostly due to functional troubles in domestic heating equipment and flue gas ducts, or the absence of proper draft in combustion equipment firing natural gas or liquid hydrocarbons. Infiltration of natural gas from broken pipes, and of carbon dioxide from sewer systems and pits with decaying materials were also reported. Traffic-generated emissions and dry cleaning shops emitting chlorinated organic solvent vapors were among the principal sources of indoor air pollution. One case of poisoning was due to the inflammation of a plastic pipe in a building.

50464 **APTIC NO. 70384**

Jensen, W.

ENVIRONMENTAL PROTECTION IN THE FINNISH PULP AND PAPER INDUSTRY. *(Umweltschutz in der Finnischen Zellstoff-und Papierindustrie). Text in German. Papier (Darmstadt), 28(10A): V110-V119, 1974. 4 refs.*

The air and water pollution situations in Finland are discussed with regard to the pulp and paper industries. Finland has no law yet controlling the emission of air pollutants. Estimates concerning emissions from the pulp and paper industry put the sulfur emission at 45% of the total S-emission of the country and the dust emission at 27%. Through evaporation and combustion of calcium sulfite waste liquor the waste water quantity has been reduced but the sulfur emission increased. In some plants measures have been taken for reduction of the sulfur emission. They include oxidation of black liquor, trapping and combustion of odorous gases, and introduction of sulfur-free pulp production processes. One such process which has gained increasing interest produces pulp in three steps, namely boiling in soda, defibration, and delignification by the oxygen/alkali method.

50465 **APTIC NO. 70623**

Jones, Richard M. and Raymond Fagan

APPLICATION OF MATHEMATICAL MODEL FOR THE BUILDUP OF CARBON MONOXIDE FROM CIGARETTE SMOKING IN ROOMS AND HOUSES. *ASHRAE (Am. Soc. Heating Refrig. Air Cond. Engrs.) J., 16(8):49-53, Aug. 1974. 9 refs.*

A mathematical model based in Turk s equation was applied to the buildup of carbon monoxide from cigarette smoking for a 3000 cu ft office room and a 20,000 cu ft one-family dwelling. Only 5 cfm per person of outside air was adequate to ensure less than 50 ppm of CO at equilibrium for the 1000 cu ft office, assuming the extreme case where 25 occupants smoke about double the normal cigarette consumption. For the 20,000 cu ft house, 1000 cigarettes/hr were required to exceed the threshold limit value of 50 ppm in 1 hr, assuming a 50 cfm outside air makeup. Carbon monoxide concentrations resulting from smoking in occupied spaces did not appear to present an inhalation hazard to the nonsmoker.

50466 **APTIC NO. 73051**

Kennedy, John F. and Homer Fordyce

PLUME RECIRCULATION AND INTERFERENCE IN MECHANICAL-DRAFT COOLING TOWERS. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 58-87, 1975. 7 refs. (March 4-6.)*

Plume recirculation and interference characteristics as well as downwind temperature distributions for 1/150-scale models of double-flow and round mechanical draft cooling towers were investigated in a laboratory fume apparatus. The dynamic scaling was based on the equality of the densimetric Froude number and the ratio of jet velocity to crossflow velocity. Plumes of positive and negative buoyancy were obtained by supplying heated and cooled water through the model tower stacks. The Froude number ranged from 2-7, and the velocity ratio from 0.4-12. Recirculation generally increased with decreasing Froude number for negative- buoyancy plumes and with increasing Froude number for positive- buoyancy plumes. Increasing the velocity ratio resulted in recirculation ratio decreases for positive-buoyancy plumes; for negative-buoyancy plumes, recirculation first decreased and then increased with velocity ratio. Increasing the stack height and stack spacing reduced recirculation. The plume configuration was slightly sensitive to Froude number and was strongly affected by the velocity ratio. Round towers showed significantly lower recirculation ratios than rectangular ones. The recirculation ratio for a two-tower system, with the second tower downwind from the first, was relatively insensitive to Froude number but decreased with increasing velocity ratio. (Author abstract modified)

50467 **APTIC NO. 70311**

Kitagawa, Y., S. Ueno, T. Soda, C. Furutani, S. Furukawa, and Y. Sadakane

INVESTIGATION OF MALODORS AROUND STOCK FARMS. *(Chikusan kankei no akushu ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):463, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan Nov. 6-8, 1974, Paper 314.)*

Two types of treatment (incineration and heat-drying) for chicken manure were compared with respect to odor emanation. Chemical analyses were correlated to answers to malodor intensity questionnaires obtained from 117 households in the neighborhood of the two poultry farms. Incineration resulted in emission of various sulfur compounds in high concentration. Higher odor intensities were reported for the polutry farm utilizing incineration. Ammonia was quantitatively present as the major odor component for both farms. Trimethylamine was hardly detectable.

50468 **APTIC NO. 70213**

Laer, R. van

AIR POLLUTION DUE TO EMISSIONS OF DIESEL ENGINES USED IN ROAD TRAFFIC. STATUS REPORT ON THE PROBLEMS ANS SOLUTIONS AS OF MARCH 1, 1974. *(La pollution par les emissions des moteurs diesel de traction routiere. Etat des problemes et solutions au 1 er mars 1974). Text in French. Commission of European Communities. Brussels (Belgium). General Direction of Domestic Market, 365p., 1974. 358 refs.*

Studies on the composition of diesel exhaust, the formation, mechanisms of the exhaust components, and possible techniques of emission and odor control in vehicle diesel engines are reviewed. Related emission regulations issued in different countries are presented. Diesel exhaust gases contain carbon dioxide, nitrogen oxides, hydrocarbons, aldehydes, carbon monoxide, phenols, soot, sulfur dioxide, phosphorus, barium, calcium, and zinc. Benzopyrene is present only during intense soot emisssions. Diesel engines emit bluish white smoke formed by unburnt or partially oxidized fuel droplets during start-up, and gray smoke of carbon crystals when hot. The odor of diesel engines is due to some 100 organic compounds, such as acrolein, n-alkanes, monoolefins, and paraffinic and aromatic aldehydes. Pre-chamber diesels and swirl-chamber diesels can contribute to soot, nitrogen oxides, and carbon monoxide emissions under specific conditions. Exhaust gas recirculation, water injection, and exhaust afterburning are among the basic principal possibilities of diesel exhaust abatement. Exhaust gas recirculation appears to be the most promising solution for the immediate future.

50469 **APTIC NO. 70663**

Lowes, T. M. and S. Michelfelder

UNDESIRED COMBUSTION PRODUCTS FROM INDUSTRIAL FLAMES. *(Die Entstehung unerwuenschter Verbrennungsprodukte aus industriellen Flammen). Text in German. Gas Waerme Int., 23(11):435-439, Nov. 1974. 16 refs. (Presented at the Kongress Thermprocess, Duesseldorf, West Germany, May 31, 1974.)*

The most important undesired pollutants emitted by furnaces are described and discussed. The emissions depend largely on the aerodynamic conditions occurring in the combustion chamber and burner. Studies carried out by the International Flame Research Federation are described which led to the development of design data for burners characterized by their low emission of nitric oxide. The possibility of controlling the emission of other pollutants by modifying the burners used is also discussed. Emissions of sulfur dioxide, sulfur trioxide, nitrogen oxides, and particulates are reviewed.

50470 **APTIC NO. 70495**

Masek, Vaclav

COMPLEX EVALUATION OF FLY DUST SAMPLES FROM HARD COAL COKING PLANTS. *(Zur komplexen Bewertung der Flugstaub-Proben aus einer Steinkohlenkokerei). Text in German. Zentr. Arbeitsmed. Arbeitsschutz, 24(11):332-339, 1974. 12 refs.*

In hard coal coking plants three kinds of fly dusts exist: fly dust from hard coal treatment, dust from the coke oven block, and dust from coke sorting. For determination of the properties and effects of this fly dust three fly dust samples and three samples of the respiratory fraction of this fly dust were taken. Dust samples from the coke oven block contained the highest amount of soot. In the coal treatment station and coke sorting station primarily sharp-edged particles were found, while near the coke oven, round tar and soot particles prevailed. The samples from the coke oven block also contained the highest 3,4 benzpyrene content. The content of soluble arsenic compounds was zero and the quantity of mercury very small. The samples further contained 0.01% by weight inorganic elements and traces of toxic heavy metals such as lead, zinc, and cadmium. In leaves of plants to which the fly dust samples were applied the total chlorphyllum content was reduced; the sample from the coke sorting station had the greatest effect in this regard.

50471 **APTIC NO. 70309**

Matsumoto, H.

ANALYSIS OF ODOR COMPOSITION IN STARCH LEES. *(Denpun kasu no akushu seibun ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):461, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 312.)*

Analysis of odor composition of starch lees was conducted. Use of Porapak Q as the packing material in the gas chromatography column allowed separation of low fatty acids as acids, rather than as esters. Representative odorous acids found in starch lees included acetic acid (47 ppm), propionic acid (29 ppm), and n-butyric acid (16 ppm).

50472 **APTIC NO. 73481**

Mauron, Bernard

OPERATION INDUSTRIAL POLLUTION. *(Operation Pollutions Industrielles). Text in French. In: Etudes de pollution atmospherique a Paris et dans les departements peripheriques en 1973. Prefecture de Police, Paris (France), Laboratoire Central, 9p., June 1974.*

Individual studies of industrial air pollution, conducted by the Police Department of Paris in 1973, are described. Dust measurements around a foundry revealed dustfall rates and suspended dust concentrations far exceeding the maximum allowable levels and also an iron content of dust samples substantially higher than the allowable limit. The dust concentration limit of 150 mg/cu m was exceeded in 27% of all cases at 100 m distance, and in 6% of all cases at 200 m distance. Dust concentrations far exceeding the allowable limit of 500 mg/cu m were measured around an asphalt plant regardless of the granulometry of the material used (sand or gravel). The wet scrubbers employed for dust separation from the flue gases proved to be inefficient. A zinc content of 2.7 micrograms/cu m was determined in dust around a zinc-plating plant against a background value of 0.48 micrograms/cu m.

50473 **APTIC NO. 70549**

Meuthen, Bernd

PROBLEMS OF CLEAN AIR MAINTENANCE IN THE COIL-COATING INDUSTRY. *(Probleme der Luftreinhaltung aus der Sicht der Coil-Coating Industrie). Text in German. Farbe Lack, 80(6):500-506, June 1974.*

Problems and practical possibilities of pollution control in the coil-coating industry are discussed. Vapors of surface-coating materials and solvents, as well as their cracking and reaction products, such as aldehydes, fatty carbonic acids, phenols, lower aliphatics, higher aromatics, styrene, silanes, bis-phenol, terpenes, alcohols, glycolether, esters, ketones, and ethers are present in the waste gases from the gas-fired drying ovens. Part of the hydrocarbons emitted by coil-coating plants has proved to be photochemically inactive, while others may contribute to the formation of photochemical oxidants. Some of the pollutants generated, such as acrolein and phenol, have very low odor thresholds. The organic vapors generated in drying ovens can be destroyed by thermal incineration at a temperature of at least 670-700 C at reaction times ranging from 0.5 to 1 sec. Other methods of pollution control in the coil-coating industry involve changes in technology or in the materials used, e.g., in the use of low-solvent or solvent-free coating materials.

50474 **APTIC NO. 73056**

Moore, D. J.

RECENT CENTRAL ELECTRICITY GENERATING BOARD RESEARCH ON ENVIRONMENTAL EFFECTS OF WET COOLING TOWERS. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, C[illegible]NF-740302, p. 205-220, 1975. 27 refs. (March 4-6.)*

Research activities of England s Central Electricity Generating Board on the environmental effects of wet cooling towers used at electrical power stations are reviewed. The activities include: the development of an assisted-draft tower, studies related to the reduction of droplet carry-over (drift) via a particular mist eliminator design, investigation of the climatological effects of cooling towers, and the collection of information on plume behavior and the correlation of this information with meteorological variables. Wet natural draft cooling towers do not appear to significantly affect the local climate when proper eliminator design is used. Theoretical predictions of ground-level fog resulting from wet natural draft towers are not borne out by observations under England s climatic conditions. Additional theoretical and field studies are required to determine if the incidence of visible plumes can be reduced either by the use of wet assisted-draft towers or by varying the ratio of sensible heat to latent heat within the tower effluent.

50475 **APTIC NO. 70571**

Murayama, Tadashi, Tatehito Ueda, Masahito Shibata, and Toichi Hayakawa

AN APPROACH TO THE STUDY OF DIESEL ENGINE EXHAUST ODOR. *(Dizeru kikan no haikishu kenkyu ni taisuru hitotsu no apurochi). Text in Japanese. Nainen Kikan (Internal Combust. Engine), 13(11):11-18, Oct. 1974. 7 refs.*

Total hydrocarbon and aldehyde concentrations in exhausts from a 4-cycle, direct injection Kubota LC engine and a 4-cycle, preheating Mitsubishi DV-4 engine were measured and their relationships with the engine conditions were studied. Light oil containing 85.60% carbon and 0.78% sulfur was used as fuel. Total hydrocarbon and hydrocarbon components were analyzed by a flame ionization detector and gas chromatography. Aldehydes were determined by the gravimetric method after being converted to 2,4-dinitrophenylhydrazone derivatives. Aldehyde components were also determined by GC. Results showed that: total hydrocarbon and aldehyde concentrations increased at low load but decreased at high load condition; both concentrations showed minimum values at optimum injection time; both concentrations increased with decreasing compression ratio and decreasing temperature of engine cooling water; the aldehydes comprised mainly lower aldehydes (under C5) with 50-70% formaldehyde; exhaust throttle was effective in reducing hydrocarbon and aldehyde concentration, particularly at low load condition.

50476 **APTIC NO. 68678**

Muromachi, Shigeo

ENVIRONMENTAL PROTECTION MEASURES CONCERNING NITROGEN OXIDES AND SUSPENDED PARTICULATES (TOYAMA PREFECTURE). *(Chisso sankabutsu oyobi fuyu ryushijo busshitsu ni kakawaru kanky hozen taisaku ni tsuite). Text in Japanese. Kankocho Kogai Senmon Shiryo (Public Nuisance Gaz.), 9(5):80-93, Sept. 1974.*

Toyama Prefecture as a whole fails to pass the national standard for the daily nitrogen dioxide average of less than 0.02 ppm by 81%. In order to reach the national environmental standard, the yearly target must be set at 0.012 ppm. With the present level of stack gas denitrification techniques, the possiblity of realization of this goal is extremely remote. The 1973 investigations of factory boilers and incinerators of 10,000 N cu m/hr or 5000 t/day or more showed that the emission quantity ranged from 7669 ton/yr in Toyama city to 122 tons/yr in the rural areas. From mobile sources, NOx emission was 2945 tons/year in Toyama and 266 tons/yr in smaller rural areas. As practical and immediate countermeasures, large scale fixed emission sources are advised to install two-stage combustion and flue gas recirculation devices, and small scale sources, improvements in burners; all sources are advised to use better quality fuels. With regard to suspended particulates, the maximum allowable emission quantity standard was set at 2918 tons/yr, while the actual emission quantity was 4327 tons/yr for 1973. This would require a reduction of 32.6%. Smaller drying furnaces and smelting furnaces in many factories had no dust collection devices, and installation of such devices was strongly urged. For larger factories, electrostatic precipitators and bag filters were recommended, and for all installations, the use of better fuel was urged. For facilities that emit dusts from the entire building such as alloy foundries, measures for an entire enclosure of the building and devices for dust control for the entire building were recommended.

50477 **APTIC NO. 70599**

Nakazawa, M. and Y. Saiki

BASIC RESEARCH ON EMISSION OF NOX, CO AND HC IN EXHAUST GAS UNDER VARIOUS DRIVING CONDITIONS. *(Jidosha no soko joken no soi ni ypru haigasu-chu no yugai seibun no haishutsu-ryo ni kansuru koso-teki jikken). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):474, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 322.)*

The variation in hydrocarbons, carbon monoxide, and nitrogen oxides emissions (g/km) during acceleration, deceleration, and cruising speeds (varied load) was measured using a gasoline engine (1700 cc) on a dynamometer. The emission quantity of these toxic components varied greatly with driving conditions, and were generally higher during acceleration compared to that at cruise. At acceleration, HC, CO, and NOx emission increased with the increase in acceleration (m/sq sec), while it decreased with the increase in acceleration range (0 to 20, 0 to 40, 0 to 60 km/hr). The CO emission decreased with an increase in deceleration (m/sq sec). At cruise, HC, CO, and NOx emissions generally increased with an increase in load, and this tendency was more evident for HC and NOx.

50478 **APTIC NO. 73050**

Patel, V. C., T. E. Croley, II, and M. S. Cheng

OPTIMUM DESIGN OF DRY-WET COMBINATION COOLING TOWERS FOR POWER PLANTS. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 24-57, 1975. 38 refs. (March 4-6.)*

A method for the design of optimum power plant cooling tower systems in which capital costs and operating costs for the most economical day-to-day operation are considered for a realistic operation horizon of 35 yr is applied to the analysis of dry-wet cooling towers of different proportions and configurations. The addition of dry surface area in modest proportions to wet towers of conventional design is shown to result in significant savings in both fuel and water consumption and consequently lower power production cost. Other benefits of combination towers include: increased options for lcoation, reduced environmental impact due to lower water requirements, less blowdown, a reduction in fogging, the apparent suitability of heuristic operation rules, and simplified preliminary design. (Author abstract modified)

50479 **APTIC NO. 73052**

Pell, Jerry

THE CHALK POINT COOLING TOWER PROJECT. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 88-127, 1975. 48 refs. (March 4-6.)*

The Chalk Point Cooling Tower Project of the State of Maryland s Power Plant Siting Program is described in terms of measures being taken to evaluate the atmospheric impact of a large natural-draft hyperbolic cooling tower that uses brackish water. The 400-foot-high crossflow tower is being rigged with a full instrumentation package designed for three-dimensional traverses. Parameters to be monitored include: plume updraft velocity, temperature, and humidity; brackish water water drift size distribution; and total water content. Plume rise and trajectory are to be monitored by stereophotography. A major research and field program is under way to determine the impact of salt deposition on local vegetation. Plume dispersion and drift deposition models are under development, and meteorological support is being provided by three-level tower instrumentation. (Author abstract modified)

50480 **APTIC NO. 73117**

Roberts, T. M., W. Gizyn, and T. C. Hutchinson

LEAD CONTAMINATION OF AIR, SOIL, VEGETATION AND PEOPLE IN THE VICINITY OF SECONDARY LEAD SMELTERS. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program. Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 155-166. 29 refs. (June 11-13.)*

Lead contamination of air, soil, vegetation, and residents living in the vicinity of two secondary lead smelters located in an urban area was studied. Fugitive dust-producing operations rather than stack emissions appeared to be the major source of environmental lead contamination. The geometric blood lead mean for 34 persons living within 150 m of one of the smelters was 27 micrograms/100 ml, and approximately 30% of the children examined showed levels of between 40 and 70 micrograms/100 ml. The major route of lead absorption by children living in the contaminated areas appeared to be ingestion of dirt and dusts rather than inhalation of suspended particles. The lead in monthly dustfall collections decreased exponentially with distance; 24-hour suspended particulate concentrations also decreased with distance. Soil concentrations of lead in the vicinity of the smelters were between 7000 and 8000 micrograms/g, and the lead content of vegetation near the smelter was as high as 40,000 micrograms/g. Lead concentrations of 24-hour suspended particulate samples collected atop roofs within 120 m of the smelters were as high as 74 micrograms/cu m.

50481 **APTIC NO. 73049**

Roffman, Amiran

ENVIRONMENTAL, ECONOMIC, AND SOCIAL CONSIDERATIONS IN SELECTING A COOLING SYSTEM FOR A STEAM ELECTRIC GENERATING PLANT. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 1-23, 1975. 39 refs. (March 4-6).*

An evaluation scheme for determining the suitability of steam plant cooling systems in terms of environmental, economic, and social considerations is presented. The scheme includes two groups of parameters: weighting factors which are functions of the sites under consideration and all the potential impacts determined and impact factors which are functions of all the effects under consideration and the type of cooling system. Representative regional impact factors can only be established with sufficient information regarding alternative cooling systems on a regional basis. Typical values of subimpact factors dealing with visible vapor plume, ground fog, icing, and drift deposition rate are tabulated for cooling lakes, spray canals, natural-draft and mechanical-draft wet cooling towers, and mechanical-draft wet-dry cooling towers. (Author summary modified)

50482 **APTIC NO. 70310**

Saijo, T., K. Saito, E. Ebisawa, and K. Taguchi

MALODORS FROM PIG FARMS. *(Yoton shisetsu no akushu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):462, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Nov. 6-8, 1974, Paper 313.)*

Components and causes of malodors from pig farms were identified. Chemical deodorization of these odors was attempted. Malodors arise mostly from porcine feces and urine. Sprinkling deodorizing solution (organic acids and phenols) on waste matter reduced ammonia odor by 66-80% over a 10-hour period. Similar tendencies were observed with trimethylamine malodor.

50483 **APTIC NO. 70559**

Saito, Junichi and Koichi Sugiyama

FLUIDIZED SLUDGE INCINERATION SYSTEM. *(Odei ryudo shokyaku Shisutemu). Text in Japanese. Sangyo Kikai (Ind. Machinery), no. 287:14-17, Aug. 1974.*

A fluidized sludge incinerator developed by the Babcock-Hitach Company is discussed. The fluidized bed diameter was 1000 mm, incineration quantity was 400 kg/hr, and treatment population was 20 000. The system consisted of a fluidized incineration with a sludge supply chute, a cement clinker supply hopper, an air cooler, an air temper, blow fans, multicyclones, an induced fan, tower bag filters, an ash conveyor, and an ash bunker. An ordinary dried sludge cake and dehydrated cake mixed with carbon particles were made and burned in the fluidized incinerator utilizing cement clinkers as a fluidization medium. The results were tested, and various gas formation was examined. By adding micro particles of carbon, the incineration quantity increased by 20-30%, but in a natural incineration, the load can be 40-60% higher, therefore the incinerator can be designed compactly. A considerable amount of sulfur and chlorine were contained in the sludge cake, and by adding carbon particles, sulfur dioxide and hydrogen chloride were formed in the combustion process. The clinkers acted as desulfurization and dechlorination agents. The surfaces of catalysts required constant regeneration, and by constantly rubbing against each other, the chemical activity of cement clinkers was maintained. When the temperature went above 850 C, the desulfurization and dechlorination rate suddenly decreased. But at about 800 C, the desulfurization and dechlorination rates were above 90 and 80% respectively. When simply filtered and dried, sludge was burned with fuel oil, and 700-1200 ppm of nitrogen oxides were formed. But when micro-particles of carbon were added, the amount of NOx formation was decreased to 1/5. All the organic matter causing bad odor was degraded at about 750 C; since the incinerator was operated at 800 C, odor elements were decomposed in a few seconds.

50484 **APTIC NO. 70572**

Sawanobori, Tatsuhiko and Masayuki Saito

NITROGEN OXIDE POLLUTION FROM HEATING EQUIPMENT. *(Danboyo kigu ni yoru NOx osen). Text in Japanese. Preprint, Society of Heating, Air-Conditioning and Sanitary Engineers of Japan, p. 55-58, 1974 (Presented at the Society of Heating, Air Conditioning, and Sanitary Engineers of Japan Annual Meeting, Tokyo, Japan, Oct. 7-8, 1973, Paper A-14.)*

The pot-type petroleum stove with forced ventilation is the most popular type of domestic heating equipment in Japan. The combustion characteristics and nitric oxide emission rate were obtained by experiments for the purpose of comparing the amount of NOx emission from ordinary homes and building heating systems. The heating efficiency was obtained by an equation, and the exhaust gas temperature was measured by a CA thermocouple. The air ratio and the combustion gas quantity were calculated by analytical results. The NOx emission unit calculated from the load curve for the entire period stoves are in use would be about 2.0 kg/t of fuel. Of the total of 305 tons of NOx emission for the season in Sapporo, 66% came from general domestic heating, 18% from local heating systems, and 16% from building heating systems. As far as the oil consumption is concerned, 82% is by domestic heating, 5% by local heating systems, and 13% by building heating systems. But for the coldest season, the NOx emission is 74% from general domestic heating, 12% from buildings, and 14% from local heating systems; in light heating seasons, 59% of NOx emission comes from domestic heating, 20% from local heating systems, and 21% from building heating systems. These domestic stoves are structurally impossible to change into combustion recirculation type; some method of increasing air ratio and controlling combustion heat would be desirable. But if the stove is used also as a hot water boiler, heat loss will be recovered.

50485 **APTIC NO. 70593**

Schindel, H. J.

NUISANCE OR HEALTH HAZARD? ASSESSMENT OF THE EFFECT OF THE POLLUTION OF AIR BY DYE FACTORIES AND MAJOR PRINTING WORKS. *(Belaestigung oder Gesundheitsgefaehrdung? Ueberlegungen zur Beurteilung von Abgasen aus Farbenfabriken und Grossdruckereien). Text in German. Oeffentl. Gesundheitswesen (Stuttgart), 35(10): 768-778, 1974.*

The components in emissions from dye factories include alcohols (methanol), saturated halogenated hydrocarbons such as methyl chloride and carbon tetrachloride, phenols, and nitro and amino derivatives of aromatic hydrocarbons. The variety of components in emissions from printing shops is equally large. Thus a simple assessment of total carbon content in the effluents is not sufficient for any evaluation of possible health hazards. Also, maximum allowable immission, emission, or working place concentrations for the individual pollutants provide no real guarantee that no health hazard is involved. Medical doctors know that concentrations far below the limit value for the total carbon emission of 300 mg/cu m air may be dangerous, particularly to patients with latent diseases such asthma bronchiale or circulatory ailments. First complaints by the population in the vicinity of dye factories or printing shops usually concern odors. In this respect industry has made great efforts financially and otherwise to combat the odor problem effectively. The methods for odor removal such as condensation, adsorption and absorption, and afterburning are briefly reviewed. Also, a brief outline of regulations concerning immission protection is provided.

50486 **APTIC NO. 70312**

Shigeta, Y., T. Ishiguro, T. Hasegawa, Y. Nagata, and N. Takeuchi

FIELD SURVEY OF ODOR AT NIGHT-SOIL TREATMENT PLANTS. *(Shinyo- funnyo no shuki chosa jirei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):464, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 315.)*

Odors emanating from waste treatment plants and kraft pulp mills were surveyed. Concentrations of odorous substances (hydrogen sulfide, methyl mercaptan, dimethyl sulfide, dimethyl disulfide, and ammonia) and physical responses to the odors were determined and correlations were derived. The major malodors from waste treatment plants were attributed to H2S and CH3SH, but (CH3)2S was also present. Malodors from kraft pulp mills included all four sulfides (H2S, CH3SH, (CH3)2S, (CH3)2S2).

50487 **APTIC NO. 70691**

Shirai, Tsugumi and Takeo Sasaki

PRESENT STATE AND FUTURE OF AUTOMOTIVE ELECTRONICS. *(Jidosha erekutoronikusu no genjo to shorai). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 28(9):726-731, Sept. 1974. 26 refs.*

Practical applications of electronic equipment to automobiles are discussed. Though internal-circuit-operated (IC) regulators have appeared in automobiles in the U. S. and Europe since 1967, further development is required primarily because of the high costs of electronic equipment replacements. In Japan, electronic equipment is used only in deluxe cars. In order to reduce costs of electronic equipment, the hybrid IC circuit is being developed. One ignition developed by GM is called the High Energy Ignition. The ignition coils and a distributor are placed in one body in the HEI and the regulating circuit, including an output transistor, is hybrid IC-operated. Another method of applying electronics to ignitions is thhe Condenser Discharge ignition, which is designed to obtain a high voltage by charging a condenser with a relatively high voltage, which is in turn discharged into primary ignition cells. The intensification of regulation of exhaust gas makes it necessary to adopt some countermeasures. Catalytic equipment and thermal reactors are not sufficient to meet this demand in terms of endurance and reliability. A supplementary regulator is required. Rotary engines which are thermal reactor-operated meet the regulations to be enforced in 1975. Bosch of West Germany has succeeded in developing a new gasoline ejector called the mass flow process, which features low cost due to development of an IC to be used exclusively for its regulating circuit.

50488 **APTIC NO. 70167**

Sorrels, Donald E., Douglas R. Lilhedahl, and Jerry L. Terry

IMPACT OF ALTITUDE ON VEHICULAR EXHAUST EMISSIONS. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 421-445. 1 ref. (Sept. 25-27.)*

Automobile emissions data were developed from a sample of resident vehicles in Leadville, Colorado, (nominal elevation of 10,000 ft above sea level) and were converted to mass data using equations developed from key-mode and mass emission testing of vehicles operating in the Denver area (5500 ft). The mass emission data were then combined with mass data developed from vehicles in Chicago (near sea level), in order to define emissions versus altitude relationships for exhaust hydrocarbons, carbon monoxide, and nitrogen oxides. Exhaust hydrocarbon emission concentrations from resident vehicles at idle tended to be higher with increasing elevation from sea level to 10,000 ft. Mass hydrocarbon emissions also tended to be higher for all vehicles at successively higher elevations, whereas nitrogen oxide emissions were lower with increasing elevations. Carbon monoxide emission concentrations from resident vehicles at idle tended to be lower at 10,000 ft than at 5500 ft; since this phenomenon was in conflict with combustion theory, vehicles operating at the higher elevations were presumably modified for improved performance. Mass carbon monoxide emissions from 1968 and newer model-year vehicles tended to be greater from resident vehicles at successively higher elevations. However, mass carbon monoxide emissions from 1967 and older model-year vehicles tended to be greater at 5500 ft than at either sea level or 10,000 ft, again indicating that vehicles operating at the higher elevations were modified. With the reversal effects of carbon monoxide emissions at idle, the establishment of minimum statewide idle emission standards does not appear to be practical.

50489 **APTIC NO. 70594**

Strauch, D.

HYGIENIC PROBLEMS OF LARGE ANIMAL CONFINEMENTS. *(Hygiene probleme der Massentierhaltung). Text in German. Zentralbl. Bakteriol. Hyg., Infektionskr. Abt. Orig. B, 159(4):309-323, 1974. 16 refs.*

Keeping animals in large confined areas causes odors and infection problems. Chemical disinfection or physical treatment of the animal manure helps avoid spreading of infectious microorganisms by using the excrements as fertilizer. Too much animal waste slurry on agricultural fields can cause odor and damage to the soil and plants. Hygienic problems are also created by feeding antibiotics to animals which may cause infectious resistance in various types of bacteria. The influence of untreated effluents on water pollution is also important. Rendering plant effluents can also cause water pollution. Legislation is being passed to reduce environmental nuisances caused by large animal confinements. Problems of odor emissions from large animal confinements are solved in many cases by aerobic aeration methods such as the aeration system by Fuchs or the oxidation ditches installed in pig stys. Other methods applied are dilution of the waste air coming from the confinements, scavenging of the waste air, or addition of chemical or biological deodorants. Ozone treatment, ultraviolet radiation, ionization, activated coal, biofilters, and waste air burning are methods which are used by industries for combating odors. For reasons of costs they are mostly not used in large animal confinements.

50490 **APTIC NO. 70376**

Sunaga, Takeshi

BAD ODORS FROM STOCKYARDS AND ANIMAL HUSBANDRY. *(Chikusan kogai ni okeru akushu ni tsuite). Text in Japanese. Kachiku Hoken Eisei Gijutsu Kenkyukai Kaiho (Bull. Assoc. Tech. Animal Hyg.), no. 22:21-23, 1974.*

A total of 3218 complaints on pollution were filed in Fukuoka in 1972, among them 27.2% resulted from bad odors. About 70% of the complaints on bad odors related to stockyards and animal husbandries. An investigation on odors was conducted at a combustion furnace and a plastic house used for treating animal wastes. The combustion furnace treated excrements from 1000 pigs and cows, and the plastic house dried excrements from 10,000 chickens in summer and 6000 in winter. Methyl mercaptan, hydrogen sulfide, and methyl sulfide were determined by gas chromatography, and ammonia determined by pridine-pyrazolone method. The NH_3, CH_3SH, and H_2S concentrations 20 m from the furnace and those at the plastic house were higher than the environmental standards.

50491 **APTIC NO. 70369**

Sunakawa, Yuichi

STUDIES ON THE TREATMENT OF FLUE GAS FROM AIR PLASMA CUTTING OPERATION. *(Purazuma haien no shori ni kansuru kenkyu). Text in Japanese. Unyusho Shiken Kenkyu Seika (Rep. Min. Trans. Res. Exper.) no. 20:22-25, 1974.*

Analysis of plasma cutting machine waste gas composition and elucidation of mechanisms of the gas formation were performed. Particulates in the waste gas were analyzed by the Japanese Industrial Standard method, ozone by the potassium iodide method, nitrogen oxides by naphthylethylenediamine method, and CO by the detector tube method. The waste gas contained 0.8-2.8 g/N cu m particulates (with ferric oxide as the main component), 0.20-1.18 ppm O_3, 34-103 ppm NO_x, and 4-17 ppm CO. Particulates were formed when ionized oxygen or other gas molecules hit the steel plate at an extremely high speed; ozone was formed by reactions similar to photochemical reactions; CO resulted from the reaction between carbon in steel and oxygen; NO_x was formed due to the collision of ionized nitrogen and oxygen. A gas treatment apparatus composed of a pulse jet type dust collector, an activated carbon adsorbent for NO_x, and a catalyst for CO conversion were tested and confirmed for high performance.

50492 **APTIC NO. 70315**

Takata, T., Y. Torihashi, M. Tamaki, M. Yeshioka, S. Tsujimoto, and N. Oki

STUDY ON POLLUTION MECHANISM DUE TO AUTOMOTIVE EXHAUST GAS. PART 3. RELATIONSHIP BETWEEN TOTAL NON-METHANE HYDROCARBON CONCENTRATION AND ITS COMPONENT CONCENTRATION. *(Jidosha haigasu ni kiin suru osen mekanizumu ni kansuru kenkyu. Dai-3- ho. Non metan tanka suiso to sosei-betsu tanka suiso no kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution, 9(2):488, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Nov. 6-8, 1974, Chiba, Japan, Paper 334.) BSTRACT*

To investigate the hydrocarbon pollution characteristics largely attributed to automotive exhaust gas, the concentration of methane, total HC, total and individual non- CH_4 HC and carbon monoxide were measured at roadside, industrial area, downtown, residential, and rural areas in Hyogo. The CH_4 concentration showed little variation with locations, and no correlation was found between CH_4 and CO, indicating that the effect of automobiles and factories on CH_4 concentration was negligible. A linear relationship was found between THC and CO, indicating the direct effect of automotive exhaust gas on THC. The concentrations of ethane, ethylene, propane, propylene, acetylene, butane, pentane, hexane, heptane, benzene, toluene, and xylene comprising non-CH_4 HC were measured by gas chromatography. Significant correlations were found between individual HC and total non-CH_4 HC in all cases.

50493 **APTIC NO. 71023**

Tsukada, T., K. Yoshizumi, T. Watanabe, and T. Oodaira

EFFECTS OF OXYGENATE-GASOLINE BLENDS ON EXHAUST GAS. *(Gan-sanso kagobutsu no gasorin eno tenka koka). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution). 9(2):476. Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th Chiba, Japan, Nov. 6-8, 1974, Paper 324.)*

The effect of oxygenated additives (esters and ketones) on automotive exhaust gas composition was investigated. Nine types of additives such as methanol, methyl acetate, acetone, ether, and others were added to commercial regular gasoline, and concentrations of nitrogen oxides, carbon monoxide, and total hydrocarbons (THC) were measured at a constant engine speed by varying the ratio of excess air in the range of 0.9 to 1.3. The plotting of measured values gave one curve for each pollutant regardless of the type of additive, indicating that the principle factor governing the formation mechanism of NO_x, CO and THC was the ratio of excess air. The relationship between NO_x and ratio of excess air at constant driving speeds of 20, 40, 60, and 80 km/hr was investigated. Emissions of NO_x decreased with the increase in ratio of excess air at higher speeds, and it increased at 20 km/hr. The variation in NO_x concentration by 10-mode driving showed an increase at idling speeds to 20 km/hr and a decrease at 40 km/hr. The emission quantity of CO, NO_x, and THC generally decreased with the addition of oxygenated compounds, though NO_x emission varied with driving speed.

50494 **APTIC NO. 70320**

Yoshino, Noboru, Yutaka Tanaka, Takeshi Nakamura, Minoru Moriguchi, and Hiroshi Wakui

PREDICTION MODEL FOR CARBON MONOXIDE AT INTERSECTION. *(Kosaten ni okeru yosoku moderu (CO)). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):493, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Nov. 6-8, 1974, Chiba, Japan, Paper 339.)*

Prediction models for carbon monoxide concentration at intersections were developed. The four prediction models developed are the max model (36 value prediction model), the CO-1 model (annual average value model), the CO-8 model (8-hour value model), and the CO-24 model (24-hour value model). A flow sheet of model development and equations for the four models are given. Examples of prediction results using these models are given in tabular form. The measured value of CO concentration obtained at intersections other than those used for model development were compared with simulation results obtained using models, and were in good agreement.

50495 **APTIC NO. 70602**

Yoshizumi, Y., K. Inoue, T. Tsukada, and T. Oodaira

ANALYSIS OF ACTUAL FLOW OF TRAFFIC IN AN URBAN AREA. *(Toshi soko no jittai-teki kaiseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):484, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 330.)*

The driving mode is one of the most important factors in determining pollutant concentration in automotive exhaust gas. Based on the eight-mode system, the driving pattern was analyzed by utilizing data on vehicle speed, engine speed, intake negative pressure, throttle opening, fuel consumption, transmission position, brake on-off, and clutch on-off as decision parameters. In the driving pattern, the idle to idle was defined as one trip. The frequency of occurrence of these eight modes in each trip was determined using data obtained on Aug. 5, 1974 at Sotoboridori (12.5 km). The frequency distribution of vehicle speed at initial driving period was also calculated. In this system, the driving pattern can be determined also by the combination of vehicle speed and intake negative pressure regardless of the acceleration and deceleration speed.

50496 **APTIC NO. 73118**

Zoller, W. H., E. S. Gladney, G. E. Gordon, and J. J. Bors

EMISSIONS OF TRACE ELEMENTS FROM COAL FIRED POWER PLANTS. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 167-172. 7 refs. (June 11-13.)*

Enrichment factors (with respect to crustal abundances) for more than 20 metals were calculated in the vicinity of a coal-fired power plant by measuring the elemental composition of the coal used, various ash fractions, and suspended particulate material emitted in the stack plume. Similar analyses were performed on ambient particulate samples collected at ground level. The enrichment factors of most of the elements analyzed appeared to be similar to values observed for background ambient particles in the area; exceptions were zinc, lead, arsenic, selenium, and antimony which showed suspended in-stack particle enrichments of 7.1, 10.5, 450, 1450, and 90, respectively. The plant emissions raised the ambient concentrations of most elements on particles rather than uniformly without greatly altering the pattern of relative concentrations. (Author abstract modified)

50497 **APTIC NO. 70533**

Japan Environmental Agency

REPORT ON THE INVESTIGATION AND ANALYSIS OF URBAN-TYPE AIR POLLUTION CONTROL MEASURES. *(Toshigata taiki osen boshi taisaku chosa kaiseki hokokusho). Text in Japanese. Kankocho Kogai Senmon Shiryo (Public Nuisance Gaz.), 9(5):59-79. Sept. 1974.*

Investigations and analyses were carried out on total emissions from fixed sources and automobiles in an urban area. Total emission from fixed sources is dependent on the number of factories, scales of facilities, fuel consumptions, total operating times, and emission coefficients. Factors that determine the emission coefficient are the types of fuel and boiler used and the combustion method applied. The type of boiler has little effect on emissions but the sulfur content in fuel has a profound effect. The carbon/hydrogen (C/H) ratio was a major factor in total hydrocarbon emission. Heavy oil C-grade emitted as much as twice as much hydrocarbon as heavy oil A-grade. Total emission from automobiles was estimated by estimating total traffic number and multiplying by an emission coefficient which was obtained by measuring the pollutant concentration per unit running distance at a given mode. The total traffic number was estimated by dividing the total area into squares (1 sq m) and using photographs taken from aircraft for revision. The average speed at off-peak traffic hours was 31.3 m/hr and that at peak hours was 27.6 m/hr.

50498 **APTIC NO. 72963**

POLLUTANT SMELLS. *Qual., Bull. Shell Comm., no. 20:5-6, March 1974.*

Human reactions to odorous emissions from an oil refinery over a period of 92 days are reported along with the estimated causes of the odors. A total of 42 odor detections were made, with 11 of these being distinctly annoying. The odors fell into the following five categories: hydrocarbons, 26%; composite (non-specific odors), 33%; hydrogen sulfide, 17%; mercaptans, 3%; and sulfur oxides, 21%. The predominant cause of the odors appeared to be due to the temporary shutdown of the sulfur recovery units. Maintenance of the desulfurization units, decoking of the visbreaker, cleaning of the drainage system, and gas refining plant malfunctions also appeared to correlate with reported odors.

50499 **APTIC NO. 72982**

Federal Power Commission, Washington, D. C., Bureau of Power

STEAM-ELECTRIC PLANT AIR AND WATER QUALITY CONTROL DATA (SUMMARY REPORT). *Rept. FPC-S-239, 202p., June 1974.*

GPO

Air and water quality data for steam-electric power plants throughout the United States are compiled for the year 1971 by state, geographical region, and by air quality control region. The estimated total particulate emissions from steam plants decreased from 4293 thousand tons in 1969 to 3830 thousand tons in 1971, a 10.8% decrease. This reduction was the result of precipitator modifications, new installations, and changes in operational modes. Sulfur oxide emissions increased from 16,826 thousand tons in 1969 to 17,237 thousand tons in 1971. However, on the basis of tons emitted per thousand megawatt-hours generated, emissions decreased by 9.6% between 1969 and 1971. This decrease was achieved solely through the use of low sulfur fuels. Emissions of nitrogen oxides in terms of tons per thousand megawatt-hours remained about the same (4.23 in 1969 and 4.17 in 1971); however, total emissions increased from 4832 thousand tons in 1969 to 5392 thousand tons in 1972. Total reported air quality control expenses reached $72.8 million in 1971, an increase of $1.5 million or 2.1% over such expenses in 1970. On a national basis, the 1971 expenses amounted to about 0.056 mills/kilowatt-hour, a decrease from the 0.058 mills/kilowatt-hour reported in 1970.

50500 **APTIC NO. 73048**

National Academy of Sciences-National Research Council, Washington, D. C., Committee on Biological Effects of Atmospheric Pollutants

VANADIUM. *124p., 1974. 217 refs.*

The atmospheric distribution of vanadium and its air pollution sources are discussed. In air, V concentrations range from as low as about 0.1 nanogram/cu m to about 1 microgram/cu m. In the Eastern United States the V concentration is much higher than continental dust would contribute and is probably related to air contamination by ash from burned coal and residual oil fuels. The largest contributions to atmospheric pollution by V are from the combustion of fossil fuels, especially coal and residual oils. The contribution of V to the atmosphere in 1968 from coal combustion was estimated to range from 1750 to 3760 tons, depending on the basis of the estimates. The contribution of V to the atmosphere from residual fuel combustion was estimated at 12,400-19,000 tons in 1969 and 14,000-22,000 tons in 1970. The ultimate fate of V from the combustion of coal and oil is not known, i.e., its half-life in the atmosphere whether it is washed out by rain, and whether, in the low concentrations found in the ambient air (0.5-1.0 m micrograms/cu m), it can catalyze oxidations, such as that of sulfur dioxide to sulfur trioxide.

1973

50501 **APTIC NO. 70211**

Bueters, K. A., W. W. Habelt, C. E. Blakeslee, and H. E. Burbach

NOX EMISSIONS FROM TANGENTIALLY FIRED UTILITY BOILERS-A TWO PART PAPER. *Preprint, American Inst. of Chemical Engineers, New York, 20p., 1973. 12 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 66th, Philadelphia, Pa., Nov. 11-15, 1973.)*

The development of nitrogen oxides prediction capability is described in Part I, via the Zeldovich mechanism and the calculated axial temperature-time history of the combustion products. Agreement with observed data was within plus or minus 15% for five oil-fired units. The NOx emission data from tangentially fired utility boilers are presented in Part II, and current design practice in relation to NOx emission control is discussed. Factors which influence the formation of NOx in utility steam generator furnaces when fired with natural gas, oil, or coal are discussed. Considerations are noted involved in the design of large boiler furnaces and firing systems for various fuels. (Author abstract)

50502 **APTIC NO. 70514**

Del Grosso, Remo

CALCULATION OF EQUILIBRIUM COMPOSITION OF AUTOMOTIVE EXHAUST GASES. *(Ind. Eng. Chem. Process Design Develop., 12(3):390-394, 1973. 11 refs.*

The influence of temperature (600-1500 K), pressure (1-60 atm), and air/fuel ratio (13.0-17.0) on the equilibrium composition of automotive exhaust gas is calculated by minimizing the total free energy with the assumption that the outlet components are known. Nitrogen oxides, principally as nitric oxide, appear to be formed in combustion chamber zones with high temperatures (1800-2000 K) and relatively high air/fuel ratios. Nitrogen oxide elimination, although easier in a reducing atmosphere, appears also possible in an oxidizing atmosphere. Ammonia formation, although negligible in the combustion chamber, appears significant at operating conditions of a highly efficient reducing catalyst. Its formation is favored at low temperatures and high pressures if the air/fuel ratio is less than stoichiometric or at high tempertures if the air/fuel ratio is greater than than stoichiometric. Carbon monoxide concentration decreases with increasing air/fuel ratios and increases with the temperature for a fixed air/fuel ratio. Its concentration is determined not only by the water-gas shift reaction but also by other reactions. The most oxidation-resistant hydrocarbons are methane, acetylene, ethylene, and benzene. Among the aldehydes, formaldehyde shows the highest concentrations for the oxidized hydrocarbon fraction.

50503 **APTIC NO. 70556**

Kirshenbaum, Gerald S.

INCINERATION OF POLYETHYLENE. *Polym. News, 2(3/4):29-33, 1973 (?). 8 refs.*

Incineration tests were conducted to determine emissions and to determine if any problems would result from the incineration of high density polyethylene milk containers. Three different kinds of refuse were burned: a control of 100% residential refuse; 25% (by weight) Fortiflex high density polyethylene milk bottles (1-gallon capacity) and 75% residential refuse; and 25% (by weight) polyethylene-coated cardboard milk containers (1-gallon capacity) and 75% residential refuse. No ecological or other problems were encountered in burning milk containers made from high density polyethylene, even at the very high concentrations used in these tests. In the actual incinerator trials, the polyethylene containers were superior to the coated cardboard containers and equal to the control in the areas of the percent carbon monoxide emitted, color of smoke, and incinerator temperatures. In addition, there was no clogging of the grates during the polyethylene burn, and the particulate emissions were well within the acceptability limits. Therefore, there are no sound ecological reasons for prohibiting the use of polyethylene containers. On the contrary, when the above ecological data are combined with the fact that the polyethylene milk container offers the consumer a container that is leakproof, shatterproof, easy to pour, readily resealable and recyclable, and 25% lighter in weight than current polyethylene-coated cardboard containers, there seems to be sound advantages for replacement of the coated cardboard containers with high density polyethylene containers. (Author conclusions modified)

50504 **APTIC NO. 73467**

Krause, U. and J. Wasilewska

CORRELATION BETWEEN DUST EMISSION COEFFICIENT AND SHARE OF BURNT COAL IN A TWO-FUEL BOILER. *(Zaleznosc wskaznika emisji pylu od udzialu spalanego wegla w kotle dwupaliwowym). Air Conserv. English translation from Polish of: Ochrona Powietrza, 7(1):18-22, 1973. Translated from Polish by A. Dangel, National Center for Scientific, Technical and Economic Information, Warsaw (Poland), Foreign Scientific Publications Department, 5p., 1974.*

NTIS: TT 73-54096/1

Dust emission measurements were made on two-fuel (coal and gas) boilers for various proportions of coal fuel and under various boiler outputs. The average dust concentration in the waste gases ranged from 0.016 g/cu m with the use of gas exclusively to 10.640 g/cu m with coal as the only fuel. The concentration of dust was directly proportional to the percentage thermal share of coal used and depended only minimally on the boiler output. The index for dust content in combustion gases per ton of coal consumed was about 123 kg/ton of coal consumed at boiler outputs of from 36-50 tons of steam/hr and an ash content of 13-20%.

50505 **APTIC NO. 70203**

Souza, Anthony F.

A STUDY OF STACK EMISSIONS FROM COAST GUARD CUTTERS (FINAL REPORT). *Scott Research Labs. Inc., Plumsteadville, Pa., Dept. of Transportation Contract DOT-TSC-429, Work Unit R-4401/ CG407, Rept. DOT-TSC-USCG 73-1, FY73, CG-D-13-73, 174p., Sept. 1973.*

Gaseous and particulate stack emissions from 14 Coast Guard cutters were measured under typical operating conditions for various diesel engine and boiler configurations. Mass emission rates at cruise power for main-propulsion diesel engines varied from 2.93-49.03 lb/1000 lb fuel for carbon monoxide, 1-29.74 lbs/1000 lb fuel for hydrocarbons, and 23.37-87.80 lbs/1000 lb fuel for nitrogen oxides. Carbon monoxide production correlated directly with rated engine rpm, whereas hydrocarbon emissions were indicative of the operating condition of the engine. Nitrogen oxides for a given engine increased with engine load. Particulates varied from .932-17.121 lb/hr. Emission rates for CO, NOx, and hydrocarbons were similar at forward and aft sampling points in most cases, indicating that water spray had little effect on such emissions. Mixing water with the exhaust also had little effect on smoke emissions.

50506 **APTIC NO. 73045**

Van Loan, M. and Larry Resnick

IMPACT OF EMISSIONS FROM FARM EQUIPMENT AND OFF-ROAD HEAVY DUTY EQUIPMENT ON AIR POLLUTION IN CALIFORNIA. *Preprint, Society of Automotive Engineers, Inc., New York 15p., 1973. 14 refs. (Presented at the Society of Automotive Engineers National Combined Farm, Construction and Industrial Machinery and Fuels and Lubricants Meetings, Milwaukee, Wis., Sept. 10-13, 1973, Paper 730830.)*

The impact of uncontrolled emissions from farm equipment and off- road heavy duty equipment using gasoline or diesel internal combustion engines is estimated for the state of California. Estimates of hydrocarbon, carbon monoxide, nitrogen oxide, sulfur oxide, and particulate emissions from diesel and gasoline operated off-road heavy duty equipment based on estimates of population, annual usage, horsepowers, and emission factors are: 30.6, 448.9, 107.2, 12.8, and 12.4 tons/day. Similar estimates for farm equipment are: 29.9, 507.9, 66.4, 4.9, and 6.4 tons/day for hydrocarbons, CO, NOx, SOx, and particulates, respectively. While farm and off-road heavy-duty equipment do not constitute major emission contributors to California s air pollution problem, the emissions from these sources are nevertheless significant. Projected estimates of hydrocarbons and NOx emissions from such equipment for the years 1975 and 1980 indicate that these emissions will not be major factors in comparison to emissions from all sources in the state.

50507 **APTIC NO. 72955**

Tennessee Valley Authority, Chattanooga, Tenn., Office of Health and Environmental Science

ENVIRONMENTAL STATEMENT. EXPERIMENTAL SO2 REMOVAL SYSTEM AND WASTE DISOPOSAL POND. WIDOWS CREEK STEAM PLANT. *Rept. TVA-EP-EIS-73-1, 120p., Jan. 15, 1973. 20 refs.*

The environmental impact of an experimental Tennessee Valley Authority air pollution abatement project involving the installation of a full-scale wet-limestone sulfur dioxide scrubber and the construction of a new disposal pond at the Widows Creek Steam Plant is evaluated. Unavoidable adverse environmental consequences in terms of air quality that are expected to result from the project include the ocurrence of acid-laden fly ash releases during startup and shutdown when the electrostatic precipitators are not operating or functioning properly and an increase in fogging and icing resulting from plume moisture content. These effects are expected to be confined to an area within 0.5-1 mi from the unit.

50508 **APTIC NO. 72960**

Hammer, Siler, George Assoc.

THE INFLUENCE OF CENTRAL CITY RADIAL FREEWAYS ON MANUFACTURING LOCATION DECISIONS. VOLUME ONE (FINAL REPORT). *Dept. of Transportation Contract DOT-FH-11-7765, 226p., Oct. 1973. 96 refs.*

The influence of central city radial freeways on manufacturing development in 10 study areas located in eight cities throughout the northeast and southeast sections of the country is examined along with the attendant environmental impact. No major negative environmental impacts are identified beyond those normally associated with urban development or beyond the scope of contemporary performance standards. A list of potential environmental effects resulting from manufacturing industries attracted to the center city locations and from the increase in transportation within the area is provided in the form of a table listing the manufacturer, the Standard Industrial Classification number, the nature of the manufacturing operation, potential effects, impact rating, and possible corrective measures.

1972

50509 **APTIC NO. 70454**

Weaver, R. S.

POLLUTION ABATEMENT AND CONTROL: FUNNEL EMISSIONS FROM CF SHIPS - CTS/DRB TASK NO. DMES 08. *Preprint, 5p., 1972 (?).*

A trip to EFB Esquimalt was undertaken to observe the operational procedures on CF ships and possible air pollution problems. Preliminary samples of funnel emissions were taken from two CF ship boilers visited. Each boiler emission stack was monitored for smoke density, particulates on a filter, and sulfur dioxide. Four measurements of flue gases were taken -- the first two during initial boiler operation on diesel fuel and the last two during burning of furnace fuel oil. Particulate values were 15.5, 15.0, 14.8, and 17.4 mg, a mean value of 15.7. The rate of emission was 0.37 lbs/hr of particulates. Sulfur dioxide concentrations were 2.38, 7.39, 1.74, and 13.0 ppm by volume corresponding to emission rates of 0.02, 0.061, 0.014, and 0.11 lbs/hr. The maximum theoretical SO2 emission rates would be 0.52 lbs/hr for diesel fuel and 2.6 lbs/hr for furnace fuel oil. Pollution control legislation and standards for several provinces and states and for Canada and America were surveyed. Further sampling of funnel emissions is planned. It was tentatively concluded from results to date that serious air pollution caused by CF ships is unlikely.

50510 **APTIC NO. 73156**

National Academy of Engineering, Washington, D. C., Committee on Power Plant Siting

ENGINEERING FOR RESOLUTION OF THE ENERGY-ENVIRONMENT DILEMMA. *National Science Foundation and Atomic Energy Commission Contract NSF-C310, Task 204, 352p., 1972. 418 refs.*

The effects of power plant siting on the environment are analyzed, with recommendations being presented for mitigating power plant siting conflicts. With regard to air pollution, available and developing technologies in plant siting and operation are adequate for an initial assessment of alternative solutions related to reducing the impacts of such plants on the air. However, the range of available alternatives is not yet explored to any significant degree. Increased emphasis is recommended for research on the fate of airborne pollutants; new and improved pollution-free methods of electrical power generation; emission fluctuations with time, distance, and meteorological variables; the effect of power plant effluents on human health and the climate; and improved controls for sulfur oxides, nitrogen oxides, particulates, and radioactive wastes.

1971

50511 **APTIC NO. 70768**

Craig, W. S.

NOT A QUESTION OF SIZE. *In: Our World in Peril: An Environmental Review. Sheldon Novick and Dorothy Cottrell (eds.). New York, Faucett World. 1971, p. 356-361. 3 refs.*

Exhaust emissions from pre-1966 (uncontrolled) automobiles and later models up to 1970 are reviewed in terms of the effectiveness of controls and the relationship of engine size to exhaust pollutants. Manufacturer emission data for both domestic and foreign cars (1970 model year) indicate substantial reductions in both average hydrocarbons and carbon monoxide, with the former ranging from 134-344 ppm and the latter ranging from 0.15-0.90% compared to pre-1966 levels of 850 ppm and 3.00%, respectively. Imports which were generally smaller showed the highest emissions for each pollutant. Manufacturers data indicating an unpredictable relationship between pollution and engine size were supported by data on 1970 models from the Los Angeles Air Resources Laboratory. An examination of pre-1966 and later model cars with respect to the 1971 California standard for nitrogen oxides shows that the NOx concentrations of 1966 and newer cars are generally higher than those of pre-1966 cars, reflecting engine modifications made to reduce exhaust hydrocarbons.

50512 **APTIC NO. 70773**

Hohenemser, Kurt and Julian McCaull

THE WINDUP CAR. *In: Our World in Peril: An Environmental Review. Sheldon Novick and Dorothy Cottrell (eds.), New York, Fawcett World, 1971, p. 463-475. 3 refs.*

Flywheel power sources for automobiles and mass transportation are discussed in terms of technical feasibility, environmental and economic advantages, and possible obstacles to their utilization. Although flywheel vehicles are in themselves pollution free, the introduction of such vehicles is expected to simply shift the air pollution problem to electrical power plants since flywheels require periodic electrical charging for their operation. However, it appears that air pollution can be more easily controlled from a few hundred widely dispersed power plants than from millions of road vehicles. The estimated cost of electricity for charging the flywheel is less than 1 cent/mi compared with the 2-3 cents/mi for gasoline and oil in an average automobile of present design. Preliminary estimates of the amount of electrical energy required for charging 100 million road vehicles in the United States indicate that the present generating capacity is not sufficient for the increased demand projected.

50513 **APTIC NO. 70767**

Macinko, John

THE TAILPIPE PROBLEM. *In: Our World in Peril: An Environmental Review. Sheldon Novick and Dorothy Cottrell (eds.), New York, Faucett World, 1971, p. 345-355. 6 refs.*

The growing contribution of gasoline-powered motor vehicles to the problem of air pollution is traced from the 1940s to the present, with various control options and alternative power sources being reviewed. Trends in increased compression ratios for internal combustion engines and the addition of fuel additives for increased performance are linked with the increasing amounts of exhaust emissions observed over the years. Presently, transportation accounts for an estimated 60% of all air pollution nationwide. Changes in engine design and operation, the employment of exhaust emission control devices, and improvement in mass transportation are cited as a means for reducing urban air pollution to 10% of its present level while still retaining thy internal combustion engine. A review of alternative power systems (steam engines, diesel engines, electrical propulsion, turbines, and the like) calls for a cautious approach until better means of energy conversion are devised.

1970

50514 **APTIC NO. 70206**

Chovin, P.

AUTOMOTIVE EXHAUST-GENERATED AIR POLLUTION. *(La pollution atmospherique par les gaz d echappement des vehicules automobiles). Text in French. Preprint, World Right Assoc., 19p., 1970. (Presented at Congress of the World Right Association on Worldwide Protection of Public Health Against Air and Water Pollution and Noise, May 15, 1970.)*

General problems of air pollution generated by motor vehicles are discussed. Gasoline engine-powered vehicles emit carbon monoxide, nitrogen oxides, unburnt hydrocarbons, 3,4-benzo(a) pyrene, hydrocarbon vapors, and lead, while diesel vehicles generate mostly smoke and nitrogen oxides. The unburnt hydrocarbon concentration increases during deceleration, while the nitrogen oxide emission increases during acceleration, accompanied by a reduction in the carbon monoxide emission. Certain pollutants generated by vehicle engines, such as nitrogen oxides and unburnt hydrocarbons, contribute to the formation of photochemical smog in areas with high traffic density and unfavorable climatic conditions. French and U. S. exhaust emission standards are compared.

50515 **APTIC NO. 67129**

Zeier, Urs von and M. Semlitsch

MICROSTRUCTURE STUDIES ON MAGNETIC SPHEROIDS FOUND IN ALPINE SNOW AND FOUNDRY DUST SAMPLES IN SWITZERLAND. *S. zer Tech. Rev. (Switz.), vol. 4, 268-274, 1970. 3 refs.*

The microstructure of magnetic spheroids found in Alpine snow and foundry dust samples in Switzerland were investigated. The particles were analyzed for elements iron, nickel, chromium, cobalt, manganese, titanium, oxygen, and sulfur. The foundry dust particles were larger. Four out of five alpine snow particles are made of polycrystalline magnetite (Fe_3O_4) with haematite (Fe_2O_3) laminae. No further elements except Fe and O_2 were detected in both of the alpine snow particles investigated with an electron microscope. Five out of 17 foundry particles consisted of magnetite with haematite laminae. Other elements found in foundry particles were Ni, S, O_2, Mn, and silicon. The fact that the alpine show particles had the same minerlogical composition as some of the foundry particles could be evidence for the industrial origin of the Alpine particles. Although most of the dust originating in modern foundries is trapped in dust catching plants, a considerable amount of the dust still adds to the daily air pollution.

1958

50516 **APTIC NO. 67749**

Bogdandy, Ludwig von, Walther Dick, and Iwan M. Stranski

KINETICS OF STEEL MANUFACTURE. *(Zur Kinetik der Stahlherstellung). Text in German. Arch. Eisenhuettenw., 29(6):329-337, June 1958. 55 refs.*

The kinetics of steel manufacture in open-hearth furnaces and oxygen converters is described, and the mechanism of the brown smoke formation in oxygen blow processes is presented. The brown smoke, characteristics of oxygen and blow steel-making processes, is formed primarily due to the evaporation of the molten bath at the site of impact of the air jet at a rate proportional to the bath temperature. The iron vapors are then condensed due to cooling of the carrier gas, and the particle size of the condensed vapor increases with the decrease [illegible] the rate of nucleation. The oxidation to brown smoke takes place first during the contact of the smoke with the atmospheric air. The dust emission can be reduced by cooling the site of impact of the air jet by means of nitrogen, water vapor, or carbon dioxide. The separation of brown smoke can be facilitated by slowing down the cooling which results in coarse particles.

CONTROL METHODS

1975

50517 **APTIC NO. 70526**

Ashida, Seiji

RECENT DEVELOPMENT ON POLLUTION CONTROLLING TECHNIQUES; AIR, WATER, SOLID WASTE. *(Saikin ni okeru kogai boshi gijutsu; taiki, suishitsu, haikibutsu). Text in Japanese. Puranto Enjinia (Plant Eng.), 7(1):41-47, Jan. 1975.*

The status on control techniques for air and water pollution and solid waste treatment methods are reviewed. Regarding air pollution, the control methods are described for sulfur oxides by fuel conversion and desulfurization; nitrogen oxides by fuel conversion, modifications in combustion methods and devices, and denitrification methods; and carbon monoxide, hydrocarbons, and NOx in automotive exhaust gas by catalytic reduction and oxidation. The technical development in pollutant measurement is a significant factor in the development of pollution control techniques. The status of water pollution and control measures is discussed from the standpoint of resource recirculation. The solid waste treatment methods and systemization of resource recovery from solid wastes are also discussed.

50518 **APTIC NO. 70200**

Austin, Thomas C.

AN EVALUATION OF THE QUESTOR EMISSION CONTROL SYSTEM. *Environmental Protection Agency, Ann Arbor, Mich., Test and Evaluation Branch, Rept. APTD-1380, 8p., 1975 (?).*

NTIS: PB 220038

Exhaust emission tests (1975 Federal Test Procedure and 60 mph steady state cruise) were performed on a 1971 Pontiac Catalina equipped with a 400 cu in. engine, automatic transmission, air conditioning, and a Questor Reverter emission control system to characterize the effectiveness of the latter during non-LA4 driving modes. The emission control system consisted of a non- noble reduction catalyst sandwiched between two partial thermal reactors. Carburetor calibration and exhaust port air injection rates were set such that a reducing atmosphere was still present after the exhaust gas passed through the first partial thermal reactor. Additional air was added after the exhaust passed through the nitrogen oxide catalyst to complete the combustion of hydrocarbons and carbon monoxide. The Questor emission control system achieved the 1976 federal emission levels at low mileage, though durability was not demonstrated. Hydrocarbon, carbon monoxide and nitrogen oxide emissions over the 1975 Federal Test Procedure were 0.15, 2.34, and 0.37 g/mi, respectively; over the 60 mph steady state tests, they averaged 0.01, 10.16, and 3.15 g/mi, respectively. The Questor system caused a 25% loss in fuel economy during stop-and-go driving. Adverse fuel economy effects were not observed during freeway operation, though some loss in emission control occurred.

50519 **APTIC NO. 73174**

Beltzer, M., R. J. Campion, J. Harlan, and A. M. Hochhauser

THE CONVERSION OF SO2 OVER AUTOMOTIVE OXIDATION CATALYSTS. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 10p., 1975. 11 refs. (Presented at the Society of Automotive Engineers Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750095.)*

Laboratory reactor tests and vehicle dynamometer runs (Federal Test) were conducted to determine the effect of vehicle operating conditions and oxidation catalyst type on the conversion of sulfur dioxide to sulfur trioxide. Factors studied included catalyst temperature, exhaust gas oxygen content, and space velocity; the results were compared with measurements of total sulfur emissions from catalyst-equipped cars. Control of exhaust sulfate appeared feasible through close control of the oxygen content of the exhaust gas, with SO2 conversion being lowered to less than 20% near stoichiometric conditions. Monolithic noble metal oxidation catalysts yielded SO2 conversions closer to equilibrium values than did pelleted systems, though the reasons for these differences were not determined. The conversion of SO2 to sulfate was thermodynamically limited with monolithic noble metal oxidation catalysts; below 800 F, kinetic control predominated with resultant low conversions. Vehicle sulfate emission control via space velocity changes was not successful. Vehicles equipped with monolithic catalysts emitted greater quantities of exhaust sulfate during the 1975 FTP and 40 mph cruise conditions than those equipped with pelleted catalysts. However, the inability to achieve a satisfactory sulfur material balance with most of the monoliths and all of the pelleted catalysts tested indicates that both systems store catalytically produced sulfates; therefore, the actual conversion for both systems may be similar. Significant differences between SO2 and sulfate yields and total sulfur balances within a group of monolithic catalysts suggested that catalyst preparation may play a more dominant role than previously believed. (Author conclusions modified)

50520 **APTIC NO. 70382**

Binder, Horst and Gerd Sandstede

RESEARCH TRENDS IN BATTERIES AND FUEL CELLS WITH REGARD TO FUTURE ENERGY SUPPLIES. *(Forschungsrichtungen bei Batterien und Brennstoffzellen im Hinblick auf die zukuenftige Energieversorgung) Text in German. Chem.-Ing.-Tech., 47(2):51-56, 1975. 55 refs.*

Owing to their high efficiency and non-polluting nature, electrochemical sources of current may play an important role in future energy supplies. Secondary cells and fuel cells are well suited for the large-scale storage of electricity. A storage capacity of about 100 million kWh is required to handle the peak daytime loading in the Federal Republic of Germany. Both the price and energy density leave much to be desired in each of the two energy converters, the battery, and the fuel cell. For this reason, new secondary batteries and new electrocatalysts for fuel cells are being developed. All new systems are briefly discussed, and progress in fuel cell technology is also considered. The first 26 MW fuel cell power station is currently undergoing development in the U. S. Fuel cells will be especially important when the hydrogen economy has become a reality.

50521 **APTIC NO. 73003**

Brinkman, N. D., N. E. Gallopoulos, and M. W. Jackson

EXHAUST EMISSIONS, FUEL ECONOMY, AND DRIVEABILITY OF VEHICLES FUELED WITH ALCOHOL-GASOLINE BLENDS. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 28p., 1975. 29 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750120.)*

The effect of alcohol-gasoline blends on exhaust emissions, fuel economy, and driveability of vehicles (1966-1974 model years) operating according to the Federal Test Procedure was evaluated. The addition of 10% methanol to gasoline (without carburetor changes) resulted in carbon monoxide reductions of between 7.1 and 12.5 g/km; hydrocarbon and nitrogen oxide emissions were not affected. The methanol addition also resulted in reduced fuel economy and driveability. Ethanol behaved similarly to methanol. The results of using alcohol-gasoline blends in 1975 cars with catalytic converters is expected to be similar to those observed in pre-1975 vehicles, though carbon monoxide reduction might not be as substantial.

50522 **APTIC NO. 73037**

Cohn, J. G., W. A. Mannion, C. E. Thompson, and J. G. Hansel

EFFECT OF THREE WAY CONVERSION CATALYST OPERATION ON THE CHEMICAL STATE OF AUTOMOTIVE SULFUR EMISSIONS. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 11p., 1975. 18 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750096.)*

A three-way conversion catalyst for the control of hydrocarbons, carbon monoxide, and nitrogen oxides was evaluated for sulfate emissions. Laboratory reactors, engine dynamometers, and vehicle tests (1975 Federal Test Procedure) indicated that the catalyst was capable of achieving the reductions necessary to meet the California 1975-76 interim standards. Moreover, in no case did the conversion of fuel sulfur to sulfate exceed 2.5% during the 1975 FTP cycle. The possibility of hydrogen sulfide formation because of operation or transient excursions into the reducing region was small, with no H2S being detected during normal excursions into the rich air/fuel region. The operation of oxidation catalysts without air pumps also appeared to virtually eliminate sulfate emissions.

50523 **APTIC NO. 70797**

Daugherty, K. E. and A. O. Wist

A REVIEW OF CEMENT INDUSTRY POLLUTION CONTROL. *Am. Ceram. Soc. Bull., 54(2):189-192, 1975. 32 refs.*

Air pollution control in the cement industry is reviewed. Particulates (8-12 micron mass median particle size) are the primary emissions from cement plants and are effectively controlled by mechanical collectors, electrostatic precipitators, filter baghouse collectors, or combinations of such control devices. The average operating efficiency of newly installed particulate control equipment is estimated at 97.7%. The expected efficiency at optimum conditions is 98.4% which corresponds to a particulate emission of 0.15% of the total clinker production under optimum conditions. Sulfur oxide emissions from cement plant stacks are generally not high since most of the sulfur evolved from the fuel source is absorbed in the kiln during the production process. Some 80-90% of the sulfur present in fuels can be accounted for in the clinker. Nitrogen oxides created by high temperature reaction processes are a major, though unregulated, emission from cement kilns. Such emissions can be sharply reduced by regulating process variables. Nonmetallic catalysts are being developed for their dry removal from stack gases. Other pollutants connected with the cement process (hydrocarbons, fluorine, and sulfides) are very minor and rarely create air pollution problems.

50524 **APTIC NO. 70609**

Dlaska, Herbert

SMELTING OF LEAD ORE AND STORAGE BATTERY SCRAP BY THE ROUND BUBBLE METHOD OF THE BLEIBERGER BERGWERKS-UNION AG (BBU). *(Die Verhuettung von Bleierz und Akkumulatorenschrott nach dem BBU-Rundherdverfahren). Text in German. Erzmetall, 28(1):6-12, Jan. 1975. 1 ref.*

A new method for recycling of storage battery scrap is described. The batteries are removed from the casings and passed to a dryer, which is necessary because battery scrap is usually very wet. Here part of the lead filler material falls out. The waste gases of the dryer are first cleaned in a cyclone and then in a cloth filter. The dried material goes from the main treatment process to the screening and wind sifting equipment. The fine material falls through the vibrating screen and is passed by a screw conveyor to the moisturizer. The separation dust is vacuumed off. This process is supported by pressurized air injected for the bottom. A second wind sifting process takes place at the end of the screen where the coarse material falls onto a conveyor belt. The separators are removed from the air flow in a cyclone and dumped. The grid plates coming from the vibrating screen go to impaction pulverizer where the remaining filler material is removed united with the fine material from the vibration screen and the cyclone succeeding the dryer, wetted and smelted like ore. The grid material is molten in special furnaces. The great disadvantage of the method is the high sulfur dioxide emission level.

50525 **APTIC NO. 73036**

Gandhi, H. S., H. K. Stepien, and M. Shelef

DURABILITY TESTING OF STABILIZED RU-CONTAINING CATALYSTS. *Preprint, Society of Automotive Engineers, Warrendale, Pa., 10p., 1975. 12 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750177.)*

Durability tests were performed on stabilized ruthenate catalysts used for reducing nitrogen oxides in automobile exhaust. Nitrogen oxide removal over durability runs up to 25,000 mi ranged from initial values of 67.0-82.0% to final values of 20.0-51.3%. However, ruthenium losses from the ruthenate catalysts were in excess of acceptable limits, and the losses were minimized only at the cost of reduced selectivity for NOx reduction. Poisoning by sulfur, lead, and phosphorus was an additional problem encountered with the catalysts. Current Ru-containing catalysts are thus still inadequate for the achievement of expected emission standards in present vehicle systems.

50526 **APTIC NO. 73002**

Gulati, S. T.

EFFECTS OF CELL GEOMETRY ON THERMAL SHOCK RESISTANCE OF CATALYTIC MONOLITHS. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 10p., 1975. 6 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750171.)*

The effects of cell geometry and dimensions on the thermal shock resistance of catalytic monoliths are theoretically examined for square and equilateral triangle configurations. The thermal gradients predicted by theory compare well with experimental results obtained in a gas-fired thermal shock unit. The triangular cell requires a lower coefficient of thermal expansion than the square cell for equivalent thermal shock resistance; if the dimensions of the square cell are adjusted to provide the same geometric surface area as the triangular cell, it also requires a lower expansion coefficient, though not as low as the triangular cell. Both geometrics require a reduction in the thermal expansion coefficient to preserve their thermal shock resistance as the cell density is increased for high geometric surface area. Data from automobile manufacturers indicate that the honeycomb monoliths possess more than adequate thermal shock resistance due to their satisfactory expansion characteristics. (Author abstract modified)

50527 **APTIC NO. 70557**

Hirst, Eric

ENERGY IMPLICATIONS OF CLEANUP OPERATIONS. *Environ. Sci. Technol., 9(1):25-28, Jan. 1975. 5 refs.*

Environmental quality considerations limit fuel supplies to those that can be extracted and burned in environmentally acceptable ways, however, large amounts of energy are required to operate pollution control systems. These factors cause environmental control to require additional fuel usage and to add to the energy crisis. Energy requirements for environmental improvement are 3.5-4.0% of total energy use. However, the quantities of energy required to achieve various environmental quality goals are relatively small. For example, the 840 trillion Btu estimated for air pollution control at stationary sources is only 1.2% of total 1970 energy use. At an annual energy growth rate of 3.5%, this represents 4 month s energy growth in 1970. The sum of all increased energy costs amounts to about 1 year s normal growth in energy use. This suggests that present energy growth rates cannot be attributed to operation of environmental protection systems. Energy needs for environmental protection can be more than offset by various conservation measures. Increased recycling, generation of electricity with solid waste, a shift from autos to mass transit, redesign of autos to improve fuel economy, and increased building insulation could significantly reduce energy growth. Such energy conservation measures would reduce pollution, conserve scarce energy resources, and generally save money for consumers. The conclusions in regard to primary energy closely correspond to those for electric energy. The energy implications of urban passenger transport, wastewater treatment, solid waste management, air pollution abatement, and waste heat dissipation are specifically discussed. (Author abstract modified)

50528 **APTIC NO. 72985**

Hughes, J. Martin and N. Thomas Stephens

ELECTRIC WIND CONTROL IN ELECTROSTATIC PRECIPITATORS. *Preprint, Virginia Polytechnic Inst. and State Univ., Blacksburg, Dept. of Civil Engineering, 16p., 1975. 15 refs. (Presented at the Environmental Engineering and Science Conference, 5th Annual, Louisville, Ky., March 3-4, 1975.)*

Electrostatic precipitator design features for minimizing electric wind and increasing particle collection efficiency are outlined, with particular emphasis on the control of fly ash from coal-fired steam plants. Electric wind reentrainment can be reduced by the following engineering modifications: alignment of the electric wind with the carrier gas flow rather than normal to the flow, the reduction of plate-to-plate spacing in order to lower the Reynolds number and turbulence in the precipitation zone without having to lower the corona voltage, the employment of shorter collection plates to reduce boundary layer buildup and keep pressure drop low, the use of electrical sectionalization via transverse corona discharge electrodes, the elimination of the plates between discharge electrodes in the charging section, and the addition of more corona wires in the charging section to increase particle charge and collection efficiency without significant increase in reentrainment.

50529 **APTIC NO. 73038**

Huntzinger, Gerald O. and Gerald E. Rigsby

HEI - A NEW IGNITION SYSTEM THROUGH NEW TECHNOLOGY. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 12p., 1975. 2 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750346.)*

A breakerless, high-energy, electronic ignition system that provides improved ignition of automobile fuel mixtures and thus less exhaust emissions is described. The system includes a maintenance-free magnetic pulse generator and integrates the ignition coil into the distributor housing. The increased energy and longer spark duration provided by the system improves the probability of ignition of hard-to-fire mixtures. Cold-starting performance is also greatly improved as a result of the inherent primary current regulation provided by thee ignition system.

50530 **APTIC NO. 70794**

Ishiguro, Tatsukichi

PRESENT STATUS AND FUTURE TREND OF DEODORIZATION TECHNIQUES. *(Akushu bojo gijutsu no genjo to kongo no keiko). Text in Japanese. PPM (Japan), 6(1):42-48, Jan. 1975. 3 refs.*

The Japanese malodor control regulations were enforced by many local governments in 1974, and the rest are expected to issue control standards and appoint control regions during 1975. The control standards set for five substances; however, the malodor problems are far more complex involving many malodorants and local environmental factors. The concept of the organoleptic panel patrol system for efficient investigation of malodor pollution is discussed. The commonly used deodorization techniques are direct combustion, catalytic oxidation, and adsorption methods. The description of direct combustion methods used in bone-meal plants and pulp mills, catalytic oxidation methods used in printing and painting plants, and adsorption methods widely used in sewage and nightsoil treatment plants and chemical industries are given. The deodorization techniques used commonly in kraft pulp mills, fish bone-meal plants, rendering plants, live-stock industry, and paint coating plants are described.

50531 **APTIC NO. 73106**

Jakuba, Stanislav and James A. McGeehan

COMPONENT DEVELOPMENT OF AUTOMOTIVE RECIPROCATING STEAM EXPANDERS. *Preprint, Society of Automotive Engineers, Warrendale, Pa., 15p., 1975. 7 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750068.)*

Progress in component development for a Rankine cycle steam expander, a low exhaust emission alternative to the gasoline spark ignition engine, is summarized. The principal components reviewed are: pistons, ring/liner combinations, the valve train, series poppet valves for variable admission steam to the cylinders, and a recompression steam relief valve. Development testing for 350 hr on a V-4 expander, attaining 26 brake horsepower/cylinder, with modified four cycle diesel pistons demonstrates the feasibility of crankcase splash lubrication using a mineral oil with the proper additives. Two other expanders are also being tested, and all three are capable of achieving water rates of below 10 lb/bhp/hr with 1000 psia/1000 F steam.

50532 **APTIC NO. 72977**

Johnston, Richard W., John G. Neuman, and Paul D. Agarwal

PROGRAMABLE ENERGY IGNITION SYSTEM FOR ENGINE OPTIMIZATION. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 11p., 1975. 16 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750348.)*

A programable high energy ignition system designed to improve the operating performace of automobiles equipped with various exhaust emission control devices is described along with some preliminary results on a single-cylinder test engine. The ignition system provides for control of arc energy by varying either the arc duration or arc current. An inductive discharge is employed to strke the arc which is sustained for any duration from a single coil. Extended arc duration appears to be of some benefit when engine operation is ignition limited by such factors as mixture ratio, mixture dilution with exhaust gas recirculation, and mixutre heterogeneity.

50533 **APTIC NO. 70619**

Keiser, Bernhard E.

A SYSTEMS APPROACH TO ENVIRONMENTAL CONTROL. *IEEE (Inst. Elec. Electron. Engrs.) Trans. Ind. Appl., IA-11(1):7-13, Jan./Feb. 1975. 4 refs.*

The use of systems engineering in environmental control is discussed. Environmental problems can be viewed using closed-loop principles such as transmission, coupling, and shielding. There is a need for a fuller development of the systems philosophy in the handling of environmental problems and for further automation in both environmental monitoring and environmental control. Analogies between control theory and pollution control concepts are given, and several applications of the system concepts are provided in the areas of shielding, filtering, and collection. The needs for poper monitoring, standards, and early warning of serous conditions are discussed. (Author abstract modified)

50534 **APTIC NO. 73487**

Lucas, G. G. and K. S. Varde

OFF-STOICHIOMETRY OPERATION OF AN SI ENGINE - A MODEL OF FORMATION AND CONTROL OF NITRIC OXIDE. *Preprint, Society of Automotive Engineers, Warrendale, Pa., 9p., 1975. 15 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750352.)*

A model that accounts for the super-concentration of oxygen atoms in the flame front in order to predict the formation and control of nitric oxide from spark ignition engine is described. Nitric oxide formation is predicted on the basis of a partial equilibrium since experimental observations indicate that the oxygen atom concentration in the combustion chamber of an engine can be higher than the equilibrium concentration, particularly in the lean mixture region. The consequences of this assumption is to increase NOx emission in the exhaust, with the change being more noticeable in the lean mixture range than in the rich mixture range. The combustion duration period is a critical parameter in NO control in the lean range. Comparisons between the model calculations and experimental measurements made on a single cylinder, four-stroke, variable compression, spark ignition engine are in good agreement. It appears that NO formation and decomposition can be adequately described by the Zeldovich mechanism provided that the correct values are assigned to the radical concentrations appearing in the kinetic process. (Author abstract modified)

50535 **APTIC NO. 72997**

Mayo, J.

THE EFFECT OF ENGINE DESIGN PARAMETERS ON COMBUSTION RATE IN SPARK-IGNITED ENGINES. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 21p., 1975. 9 refs. (Presented at the Society of Automotive Engineers Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 650335.)*

Based on calculations showing that fast combustion rates tend to produce low nitrogen oxide levels, the effects of different automobile engine design factors on combustion rate were determined for 17 different engine configurations. The single factor resulting in the largest average reduction in burn time independent of the presence of the other factors was spark plug gap location. Decreasing burn time resulted in increased rates of pressure rise and hydrocarbon emissions and reduced cyclic variation and ignition delay time. Nitrogen oxide reductions were achieved when burn time was decreased while operating with 20% exhaust gas recirculation. (Author abstract modified)

50536 **APTIC NO. 72953**

Moore, G. E.

A LOW-NOX BURNER FOR RANKINE-CYCLE ENGINE AND OTHER WATER-HEATING SYSTEMS. *Preprint, General Electric Co., Schenectady, N. Y., Corporate Research and Development, 17p., Jan. 20, 1975. 11 refs.*

A low-nitrogen oxide burner for Rankine cycle engines and other water-heating systems is demonstrated both theoretically and experimentally using non-adiabatic flames stabilized on cooled porous structures. Thermal relationships involving the fraction of the whole enthalpy flux of the mixture that is dissipated by the burner are applied specifically to applications where the burner coolant is also the cycle working fluid. The burning of lean mixtures of air and propane or gasoline with a laboratory-scale all copper flat burner resulted in essentially complete combustion at 2000 K or lower and yielded nitrogen oxides concentrations of 30 ppm or less. No hydrocarbons were detected in the burned gas, and carbon monoxide were about the same as those commonly observed in any premixed lean hydrocarbon-air flame (a few hundred ppm).

50537 **APTIC NO. 70379**

Niemeyer, E. A.

CONVERSION OF THE LAEGERDORF CEMENT WORKS FROM THE WET TO THE SEMI-WET PROCESS - DESIGN AND CONSTRUCTION OF THE PLANT EXTENSION. *(Umstellung des Zementwerks Laegerdorf vom Nassauf Halbnassverfahren. Planung und Bau der Werkserweiterung). Text in German. Zement-Kalk-Gips (Wiesbaden), 28(1):1-17, Jan. 1975.*

Conversion from the wet to the heat economizing semi-wet process of cement manufacture has acquired additional importance as a result of the energy crisis. In a design and construction period of no more than 14 mo, a grate preheater kiln operating on the semi-wet principle with a clinker output of 3300 tons/day was installed at the Laegerdorf works. The preheater consists of three chambers. In the pre-drying chamber the heat of all the exhaust air from the cooler and of the exit gases from the bypass is utilized. The rotary kiln is followed by a travelling grate cooler. With a bypass flow of 7% and a 21.7% moisture content of the pressed filter cake, the guaranteed heat consumption is 900 kcal/kg of clinker. A comparative review of the overall heat consumption, including the other economic factors, indicated for 3300 tons/day kiln systems using soft chalk and sticky clay with natural moisture content above 22% a distinct advantage, in terms of process technology and cost, for the semi-wet grate preheater process as compared with the wet process or the purely dry process.

50538 **APTIC NO. 70381**

Schwarzmann, M.

METHANOL: SYNTHETIC RAW MATERIAL AND SOURCE OF ENERGY? *(Methanol: Syntheserohstoff und Energietraeger)? Text in German. Chem.-Ing.-Tech., 47(2):56-61, 1975. 14 refs.*

The future employment of methanol as a source of energy has been increasingly discussed in the last few years. Attention has been mainly directed to the use of the currently flared petroleum gases and to the clean-air use of coal via methanol. Closer examination shows, however, that the detour via methanol is unfavorable from the energy point of view. This is particularly so as regards utilization of the amounts of natural gas currently flared where transport of liquid gas exists as an alternative. With the ever-increasing price of petroleum gas, the methanol route can no longer compete with the transport of liquid gas. Furthermore, the amounts of gas flared in the Middle East are often overestimated. They correspond to an oil equivalent of 50 million tons per annum and may therefore be disregarded as an alternative source of energy for large consumers. The 50 million tons of methanol obtainable per annum from petroleum gas could, however, be of considerable importance as a raw material for the chemical industry.

50539 **APTIC NO. 70726**

Voelker, Frank C., Jr.

A CONTEMPORARY SURVEY OF COKE-OVEN AIR EMISSIONS ABATEMENT. *Iron Steel Engr., 1975:57-64, Feb. 1975. 11 refs.*

The sources control of coke oven air emissions are reviewed. Oven charging accounts for the major amount of emissions from all sources. The amount varies depending upon equipment design and operating practices. There are three concepts in use ofr controlling charging smoke: the external collection and cleaning of gases from the larry car or standpipes; collection of gases in the collecting main system; and pipeline charging. Oven pushing is an emission source that varies widely from plant to plant and is caused by pushing green coke. Coke guide hoods were developed in the 1960s. Emissions are collected in the hood and conducted to the gas scrubbers, which are mounted on the coke-guide car. Coke quenching causes large amounts of steam to be generated and some particulate matter. Several designs of suppressors are available including wooden baffles, coke beds, and back sprays. The majority of installations use wooden baffles. When properly maintained, baffles can remove most of the entrained particulate matter. The drizzle of the water from the quenching plume can be a problem in the plant.

50540 **APTIC NO. 73105**

Wyczalek, Floyd A., Daniel L. Frank, and John G. Neuman

PLASMA JET IGNITION OF LEAN MIXTURES. *Preprint, Society of Automotive Engineers, Inc., Warrendale, Pa., 13p., 1975. 14 refs. (Presented at the Society of Automotive Engineers, Automotive Engineering Congress and Exposition, Detroit, Mich., Feb. 24-28, 1975, Paper 750349.)*

Single-cylinder and multi-cylinder dynamometer tests and vehicle evaluations of a plasma jet ignition system used in conjunction with a modified combustion cylinder head are reported. Significant nitrogen oxide emission reductions are obtained, though emissions below 2.0 g/mi are not consistently achieved. The NOx reduction is attributed to a decrease in gas residence time at high gas temperatures and a lower thermodynamic gas temperature history. The NOx reduction, however, is accompanied by an increased hydrocarbon emission level which is attributed to the blind cavity which increases combustion chamber surface area and consequently the total surface quench film mass. Thus, exhaust aftertreatment appears to be required for total emission control with the system.

1974

50541 **APTIC NO. 70677**

Acres, G. J. K.

CATALYTIC SYSTEMS FOR EXHAUST EMISSION CONTROL FROM MOTOR VEHICLES. *Chem. Ind. (London), 22:905-908, Nov. 16, 1974. 5 refs.*

Automobile emission legislation such as the Clean Air Act has been passed to reduce automotive emissions which cause photochemical smog. The major sources of emissions are those from the engine exhausts. Catalytic oxidation systems have been developed to reduce carbon monoxide and hydrocarbon emissions. Exhaust gas recirculation and reduction catalysts have been developed to remove nitrogen oxides. The CO/HC oxidation catalysts, NOx reduction catalysts in two-bed systems, and CO/HC/NOx emission control on a single catalyst unit are discussed. Catalytic fuel gasification is also described as a means to reduce CO, NOx, and HC without relying on catalytic exhaust systems.

50542 **APTIC NO. 75218**

Ando, Jumpei

STATUS OF FLUE GAS DESULFURIZATION TECHNOLOGY IN JAPAN. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization, Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-a, p. 125-148, Dec. 1974. 5 refs. (Nov. 4-7.)*

NTIS: PB 242572/AS

The status of flue gas desulfurization technology in Japan is reviewed along with its application to the power industry. Wet limestone processes are the most promising in Japan, and processes producing gypsum as a by-product are being planned for all of the large power plants. Among the double alkali type processes, the Chiyoda process and the sodium-limestone processes are being used widely. Among other processes, the Wellman-Lord process is the most widely used along with the sodium scrubbing processes that produce sodium salt by-products. Problems common to wet processes being used in Japan are reheating and wastewater treatment. Dry processes being used include the use of activated carbon, copper oxide, and dry sodium absorption. The various desulfurization processes being used in Japan are listed according to the type of process, the application, the plant capacity being served, the year of completion, and the by-product yield resulting from the process.

50543 **APTIC NO. 70731**

Aoki, Hideo

A METHOD OF EVALUATING THE PERFORMANCE OF GAS ABSORBENTS AND THE PROPERTIES OF LIOH ABSORBENT. *(Gasu kyushuzai no seino hyokaho to LiOH kyushuzai no seishitsu ni tsuite). Text in Japanese. Boeicho Gijutsu Kenkyu Honbu Giho (Tech. Rev., Agency Natl. Defence, Tech. Res. Inst.), no. 574:1-11, Jan. 1974. 12 refs.*

The temperature characteristic of a granular gas absorbent is an important factor from the viewpoint of practical use. In the existing continuous flow method, the measurement of the temperature characteristic is difficult due to the exothermic reaction of absorption. The use of a micro-reactor, which is a type of gas chromatograph in which the absorbing gas is supplied as pulses, is evaluated. By the use of a carrier gas with a high thermal conductivity, such as helium, the heat accumulation in the reactor can be eliminated, and the conversion rate (activity) and absorption capacity can be measured simultaneously. The temperature characteristic of lithium hydroxide used as absorbent for carbon dioxide was measured. The reaction rate of LiOH and CO2 producing lithium carbonate was 75% at room temperature, and decreased abruptly at temperatures above 80 C. The reaction mechanism of LiOH and CO2 and the reaction product lithium carbonate were studied in terms of LiCO3-LiOH volume ratio and by the observation of absorbent surface by means of the scanning electron microscope and powder X-ray diffraction method. The effect of humidity on absorption reaction, shape retention characteristics of absorbent, and regeneration of absorbent acitivity are also discussed.

50544 **APTIC NO. 70505**

Asakawa, Yoshifumi and Soei Kanai

PURIFICATION OF AIR AND THE SELECTION OF CLEANER EQUIPMENT. *(Kuki no seijoka to joka sochi no sentei). Text in Japanese. Kuki Chowa to Reito (Air Cond. Refrig.), 14(10):95-102, Oct. 1974.*

A general discussion is given on dust purification and the selection of dust collectors. Dusts requiring treatment include sand dust, fiber dust, carbonaceous dust, and smoking mist. Airborne particles which are harmful are those having particle size of 0.1-5 micron. Dust collectors are generally classified as filter, electric, and mechanical types. Filters including panel, wave type and automatic rolling filters are used for dusts larger than 5 micron and the collecting efficiency can be as high as 85%. Electrostatic precipitators of a charge type or induction type are used for dust 0.1 to 10 micron in size; and the collecting efficiency for small particles is over 90%. Bag filters are for dust 0.3 to 30 micron in size; and the collecting efficiency is 80-95%. Factors to be considered in designing a dust collecting system are degrees of indoor and outdoor air pollution, indoor dust concentration distribution, ventilation desired, numbers of persons residing or working in the building, and the air purification efficiency desired.

50545 **APTIC NO. 73096**

Ashworth, R. A. and B. C. Hsieh

LOW BTU GASIFICATION OF COAL: WHO NEEDS IT AND HOW CAN IT BE IMPROVED? *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650[illegible]4-118, ROAP 21ADD, 21AFJ, p. 315-324, Oct. 1974. 16 refs.*

The application of low Btu gasification of coal in industrial heating and advanced gas turbine/steam turbine electric power generation is discussed. The desired attributes of low Btu coal gasification systems are compared with the commercially proved gasifiers to determine further research and development needs. For the industrial heating application, modest research and development is required. Intensive development work is required for the advanced combined cycle application. The environmental and process restrictions are tabulated for gas effluents as they apply to industrial heating and combined cycle power use. Hot cleanup of hydrogen sulfide and particulate has potential application possibilities in advanced combined cycle power systems. For H_2S removal, molten salt, iron oxide, and limestone or dolomite processes are front-runners in the research and development stage. Hot particulate removal process development has not been extensive to date, and increased effort is necessary. A comprehensive low Btu coal gasification research and development effort for these two market areas will cost an estimated $350 million over the next 15 yr. (Author abstract modified)

50546 **APTIC NO. 73090**

Atwood, Mark T.

COLONY OIL SHALE DEVELOPMENT PARACHUTE CREEK, COLORADO. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 181-184, Oct. 1974. 2 refs.*

The pilot and field development of a process for the conversion of oil shale to oil, known as the TOSCO II process, is described. Raw shale is fed through a surge hopper and preheated by dilute phase liquid bed techniques. The preheated feed is then transported to a pyrolysis drum where it is contacted with heated ceramic pellets. The solid processed shale leaves the pyrolysis drum and passes through a trommel screen; then it is cooled and goes to storage. Pyrolysis vapors are condensed in a fractionator, and uncondensed hydrocarbon gases can be used as an inplant fuel or can be processed to produce hydrogen. The pyrolysis gases are obtained undiluted with nitrogen and include along with hydrocarbons (the major constituents) carbon monoxide, hydrogen, carbon dioxide, and hydrogen sulfide. The final product of the process is a fuel oil with very low levels of nitrogen and sulfur. The processed shale is compacted and disposed of as landfill. Revegetation of the shale is accomplished with the aid of fertilizers, water application, and the addition of various organic materials that serve to improve the water infiltration capacity of the processed shale.

50547 **APTIC NO. 70919**

Bakke, Even

THE APPLICATION OF WET ELECTROSTATIC PRECIPITATORS FOR CONTROL OF FINE PARTICULATE MATTER. *United States-USSR Working Group, Stationary Source Air Pollution Control Technology, Control Fine-Part. Emiss. Ind. Sources Symp. Proc., San Francisco, Calif., 1974, p. 489-520. 7 refs. (Jan. 15-18, Paper 21.)*

The design and application of a continuous-sprayed, parallel-plate, horizontal-flow wet electrostatic precipitator is described. The performance is not dependent on the dust resistivity. Particle parameters that must be considered are the relative dielectric constant of the material and its size. Reentrainment loss is negligible and cleaning (rapping) losses are nonexistent. The application of a three-field wet electrostatic precipitator to an aluminum reduction cell operation resulted in solid particle collection efficiencies exceed 99.5%, with 80% of the particles being less than 1 micron. Removal efficiencies higher than 95% were measured on condensable hydrocarbons (tar fumes). The removal efficiency did not change significantly with changes in the dust particle size distributions.

50548 **APTIC NO. 75251**

Barnard, R. E., R. K. Teague, and G. C. Vansickle

CALSOX SYSTEM DEVELOPMENT PROGRAM. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74 126-b, p. 1127-1149, Dec. 1974. (Nov. 4-7.)*

The CALSOX flue gas desulfurization process is described along with pilot plant studies and the process design for a 125 MW demonstration plant. The CALSOX system removes sulfur dioxide from flue gas by absorption in an aqueous ethanolamine solution, using a relatively simple gas/liquid contactor. Removal of the sulfur values f om solution occurs externally of the contactor by precipitation with lime in a system designed specifically for this purpose. Afte separation of the insoluble calcium salts by filtration, the regenerated absorbent solution is returned to tee system. Thus, but minimizing preci itable calcium ions in the gas/liquid contactorg scaling is prevented. Operation of a 3000 acfm pilot unit resulted in SO_2 removals of at least 90% and the absence of scaling and plugging in the gas scrubbing equipment. The cost of a 125 MW demonstrati n plantis estimated at about $9 million which is $72/KW installed capacity. The operating cost is estimated at about 3.0 mils/KW-hr. (Author abstract modified)

50549 **APTIC NO. 71055**

Benson, Homer E.

SEPARATION OF CO_2 AND H_2S FROM GAS MIXTURES. *(The Benfield Corp., Berwyn, Pa.) U. S. Pat 3,823,222. 8p., July 9, 1974. 3 refs. (Appl. Jan. 10, 1972, 9 claims).*

A regenerable aqueous alkaline scrubbing process for the removal of the acid gases carbon dioxide and hydrogen sulfide from hot steam-containing gas mixtures is described that provides for increased overall recovery of stripping steam. The alkaline scrubbing solution is circulated between a high-pressure absorption stage and a low-pressure regeneration stage where the solution is steam-stripped. More efficient production of stripping steam from the hot feed gas is accomplished by generating a first supply of moderate-pressure steam (e.g., 50 psi) in a water boiler, preferably supplied by aqueous condensate generated in the scrubbing system. The first steam supply is utilized as motive steam in a steam ejector which creates a reduced pressure in a flashing zone supplied with hot regenerated solution, thereby producing flash steam which is compressed by the motive steam and fed into the regenerator as stripping steam. The hot feed gas leaving the first boiler generates a second supply of lower-pressure steam by indirect heat exchange with regenerated scrubbing solution. (Author abstract modified)

50550 **APTIC NO. 73083**

Berty, Thomas E. and James M. Moe

ENVIRONMENTAL ASPECTS OF THE WESCO COAL GASIFICATION PLANT. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 101-106, Oct. 1974.*

The Lurgi gasification process is reviewed in terms of its process features and environmental impact. Thee process involves reacting coal with oxygen and steam to form a crude gas which is primarily a mixture of carbon dioxide, carbon monoxide hydrogen, methane, and water vapor. All of the tars, tar-oil, naphtha, phenols, and fatty acids are separated from the gas stream by cooling; this also condenses most of the water from the gas. The partially purified gas stream is then treated in a Rectisol plant to remove acid gas constituents, resulting in a very pure mixture of CO, CO_2, H_2, and CH4. A Claus sulfur plant is used for sulfur recovery, with the tail gas from the Claus plant being incinerated to oxidize hydrogen sulfide to sulfur dioxide. The flue gas is then treated for SO2 removal. The CO2 stream vented to the atmosphere from the Rectisol plant also contains 0.35% by volume of ethylene; in some cases it may be necessary to remove the latter component from the stream with a catalytic oxidizer or some other clean-up device.

50551 **APTIC NO. 70348**

Bibus, Erich

ENERGY FROM OLD TIRES. *(Energie aus alten Reifen). Text in German. Planen-Pruefen-Investieren, 26(11):63-64, 1974.*

A tire incinerator is described which fulfills all demands concerning low dust emission and economic operation. The tires fall through an automatic lock onto the stepped grate of the combustion chamber. At temperatures above 800 C the plasticizer oils begin to explode, raising the temperature to 1400 C. The rubber is burned at temperatures around 1200 C. The combustion gases are cooled in three chambers to 1000 C and supplied to a radiation boiler producing 8 tons of steam/hr with a pressure of 70 bar. The steam is used for the generation of electric power. The flue gases leave the boiler with a temperature of 350 C and are further cooled with atmospheric air to 140 C in an underground cooler. With this temperature the gas enters the cloth filter casing with 224 tubular bags where the dust concentration in the gas is reduced to 50 mg/cu m gas.

50552 **APTIC NO. 70208**

Bonne, Ulrich, Spencer B. Schuldt, and A. E. Johnson

PROCESS CONTROL FOR INCREASED EFFICIENCY. *Preprint, Inst. of Gas Technology, Chicago, Ill., 23p., 1974. 9 refs. (Presented at the Institute of Gas Technology, Symposium on Efficient Use of Fuels in Process and Manufacturing Industries, Chicago, Ill., April 16-19, 1974.)*

Several aspects of the fuel efficiency maximization problem are reviewed, and solutions obtained recently for selected processes through improved controls are presented. The discussion covers: examples of energy savings to be realized through changes in the design and/or operating strategy of the energy conversion and energy-using subsystems; elements of conventional control technology and their application to combustion systems; and, mathematical modeling and benefits achievable with advanced multi-variable control/optimization techniques applied to boilers, fluid catalytic crackers, and fuel gas generating plants. (Author abstract)

50553 **APTIC NO. 75220**

Borgwardt, Robert H.

EPA/RTP PILOT STUDIES RELATED TO UNSATURATED OPERATION OF LIME AND LIMESTONE SCRUBBERS. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization, Proc. Symp., Atlanta, Ga., 1974. Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-a, p. 225-240, Dec. 1974. (Nov. 4-7.)*

NTIS: PB 242572/AS

Pilot studies on the unsaturated operation of lime and limestone scrubbers are described along with a proposed mechanism for unsaturated operation. In addition to eliminating the potential for scaling of absorber internals, unsaturated operation is also capable of increasing the amount of clarified liquor available for mist eliminator washing. Unsaturation appears to be accounted for by a mechanism wherein sulfate formed by oxidation is purged, without crystallization, as a solid solution within the precipitated calcium sulfite. The amount of sulfate that can be incorporated is related to the sulfate activity in the scrubbing liquor and the SO2 precipitation rate in the hold tank. The observed superiority of lime versus limestone for the development of unsaturated conditions is attributed to the higher precipitation rates and low oxidation that are characteristic of lime systems. The presence of chloride makes it more difficult to operate in the unsaturated mode, while the addition of magnesium enhances unsaturated operation. (Author abstract modified)

50554 **APTIC NO. 70921**

Brock, James R.

BASIC PROCESSES IN FINE PARTICLE CONTROL. *United States-USSR Working Group, Stationary Source Air Pollution Control Technology, Control Fine-Part. Emiss. Ind. Sources Symp. Proc., San Francisco, Calif., 1974, p. 545-562. 4 refs. (Jan. 15-18, Paper 23.)*

Some of the fundamental physicochemical processes available for fine particulate control are analyzed. Basic control processes are classified as primary and secondary. Primary processes, those which directly produce a particle migration velocity, include: impaction, diffusion, electrophoresis, thermophoresis, and diffusiophoresis. Secondary processes, those which alter the particle size distribution so that the primary processes will be more efficient, include: coagulation, condensation, and charging. New techniques for fine particle collection are possible utilizing coagulation and condensation in conjunction with the primary processes. Only a relatively small number of primary and secondary processes have been utilized up to the present; thus, it is likely that improvement can be obtained through additional investigation of fine particle control techniques. (Author abstract modified)

50555 **APTIC NO. 73100**

Cecil, C. Blaine

OIL SHALE DEVELOPMENT-SOME ENVIRONMENTAL CONSIDERATIONS. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 353-359, Oct. 1974. 4 refs.*

The impact of an oil shale processing facility on air quality is discussed. There will be minor effects such as slightly higher local surface temperatures, increased local humidity, minor interference with existing diurnal wind patterns, and a slight reduction in local solar radiation. There may be increases in ambient levels of sulfur oxides, nitrogen oxides, particulates, hydrocarbons, and carbon monoxide resulting from plant stack emissions as well as the generation of fugitive dust. Air contaminants which may be released from a commercial plant will be acceptable to both Federal and State authorities.

50556 **APTIC NO. 70510**

Chevalier, G. and P. Zettwog

POSSIBILITIES OF CEA IN THE DOMAIN OF AIR POLLUTION CONTROL TECHNIQUES. *(Possibilities du CEA en matiere de techniques de lutte contre la pollution de l air). Text in French. Bull. Inform. Sci. Tech. Commis. Energ. At. (Fr.), no. 191:61-65, April 1974. 10 refs.*

The principal air pollution control techniques studied by the CEA (Atomic Energy Commissariat), such as filtration, adsorption, absorption, and afterburning, are reviewed. The specific air pollution control method to be applied should always be chosen as a function of the results of the detailed analysis of the problem. In filtration techniques, the trend goes toward heat- and chemical-resistant filter materials with high retention efficiency, even for the submicron size range. The development of porous, granulated adsorbents, the aging and saturation of adsorbents, and the effects of parasitic chemical reactions and temperature on the adsorption process, were studied. Gaseous pollutants can be retained by dissolution in a solvent, e.g., hydrochloric acid in water, or by a chemical reaction, as in the interaction of chlorine with an alkaline compound, or of sulfur dioxide with alkali earth metals or ammonia. The thermal incineration (afterburning) of gaseous, and especially malodorous compounds requires a certain temperature, reaction time and turbulence to be maintained. Catalytic incineration, using noble metal catalysts or copper, vanadium, chronium, or manganese, is possible at much lower temperatures than thermal afterburning. However, waste gases to be purified by catalytic afterburning should not contain particulate matter because the latter tends to reduce the contact surface.

50557 **APTIC NO. 70201**

Cooper, Hal B. H.

COST EFFECTIVENESS OF RECOVERY FURNACE ODOR CONTROL IN THE PULP AND PAPER INDUSTRY. *Preprint, American Inst. of Chemical Engineers, New York, 31p., 1974. 37 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 78th, Salt Lake City, Utah, Aug. 19, 1974.)*

The control of malodorous sulfur gas emissions from kraft recovery furnaces is discussed. Odor control approaches include retrofit by either liquid scrubbing or indirect contact evaporation, or by process modification through black liquor oxidation with air or oxygen and control of furnace operating conditions. In-plant process modifications can be less expensive in terms of capital cost than furnace retrofitting or stack gas treatment, and may be more effective in terms of reduced operating costs at low oxygen and electric power unit costs. Indirect contact evaporation of black liquor is less capital cost effective than black oxidation, but may involve energy savings in reduced fuel consumption. (Author abstract modified)

50558 **APTIC NO. 70358**

Date, Rin, Kazuo Nakagawa, and Akira Ishizuya

COMBUSTION CHAMBER DEVICE FOR INTERNAL COMBUSTION ENGINE. *(Nainen kikan no nenshoshitsu sochi). Text in Japanese. (Honda Giken Kogyo KK Tokyo (Japan)) Japan. Pat. Sho 49-41205. 3p., Nov. 7, 1974. (Appl. June 14, 1971, 1 claim).*

Modification of a double combustion chamber installation for an internal combustion engine is described. The combustion chamber for the internal combustion engine consists of a primary combustion chamber and a secondary combustion chamber, connected by a passage. Ignition occurs by means of a spark plug in the secondary combustion chamber, and the resultant flame ignites the dilute gas mixture in the primary combustion chamber. A fuel injection chamber with a fuel injection nozzle attachment is connected to the secondary combustion chamber. A secondary air intake vent, which only opens at the time of fuel injection, is installed in the connection. Thus the fuel injection chamber is connected to the atmosphere by way of a fixed, constricted neck, and the passageway formed by the exterior wall of the fuel injection nozzle and the interior wall of the fuel injection chamber. Durability of the fuel injection nozzle is increased, since it is not exposed to high temperature combustion gas. At the same time, combustion rate is improved because of increased fuel vaporization. A diagram is included.

50559 **APTIC NO. 71035**

Dennis, Richard

COLLECTION EFFICIENCY AS A FUNCTION OF PARTICLE SIZE, SHAPE AND DENSITY: THEORY AND EXPERIENCE. *J. Air Pollution Control Assoc., 24(12):1156-1163, Dec. 1974. 13 refs.*

The performance features of both industrial and experimental fabric filter systems are analyzed with respect to dust properties (particle size, shape, and density), fabric properties, and methods of filter cleaning. Fractional particle efficiencies in the 0.05-0.5 micron range are not strongly size dependent. Efficiencies generally vary form 85- 99.5%, depending on the weight and size distribution of the dust deposited on the filters. High level particulate removal cannot be expected if the fabric possesses a high free area, and outlet concentrations increase rapidly when the fabric pore diameter is about 10 times the particle diameter. Test results from evaluations of various fabric filter cleaning systems with several dust/fabric combinations and various fabric cleaning procedures indicate the following sources of particulate emissions from fabric filters: small-sized inlet dust that passes directly through the filter, dust that migrates through the filter by successive deposition and reentrainment under the combined effects of aerodynamic and mechanical (vibrational) forces, dust dislodged from the shaken fabric during cleaning that has penetrated the clean air region, and dust loosened during cleaning as a result of insufficient bonding to the fibers or interstitial dust structure to resist the dislodging forces.

50560 **APTIC NO. 75217**

Devitt, Timothy W. and Fouad K. Zada

STATUS OF FLUE GAS DESULFURIZATION SYSTEMS IN THE UNITED STATES. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization, Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-a, p. 17-123, Dec. 1974. 4 refs. (Nov. 4-7.)*

NTIS: PB 242572/AS

The status of flue gas desulfurization technology in the United States is reviewed, with case histories being given for four power plant installations. There are 19 operating flue gas desulfurization systems on utility-size boilers; 13 are lime/limestone, two are magnesium oxide processes, two are sodium carbonate processes, one is a double alkali process, and one is based on catalytic oxidation. A total of 17 units are under construction and 62 units are being planned. Approximately 7000 MW of capacity (50% retrofit and 50% new installations) are estimated to be controlled by flue gas desulfurization by 1975. Sulfur dioxide removal efficiencies for the operating units range from approximately 70-90%. The total installed capital costs of these systems vary from about $20/KW to over $100/KW. Chemical problems relating to reliability and availability of flue gas desulfurization systems are being overcome at most plants, although many units are still faced with various mechanical problems. Availability data on a common basis are inadequate for a quantitative appraisal of this parameter.

50561 **APTIC NO. 73099**

Dinneen, G. U.

OIL SHALE AND ITS POTENTIAL UTILIZATION. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 341-352, Oct. 1974. 18 refs.*

The potential environmental effects of oil shale utilization are discussed. Shale oil produced by some surface retorts, such as the gas combustion retort, is usually a dark viscous material with a relatively low sulfur content (0.60 wt%) but with a high pour point and a high nitrogen content (2.16 wt%). Environmental effects directly associated with oil shale processing are expected to be from retorted or burned shales, waters, that have been produced or used in processing, and gases. Many portions of the major United States deposit at Green River appear amenable to mining and aboveground processing as a means for recovering shale oil. Gases from oil shale processing are not expected to have a unique composition, so gas treating methods being developed by other industries to comply with environmental requirements should be applicable to oil shale gases.

50562 **APTIC NO. 70642**

Engels, L. H.

DUST TECHNOLOGY - METHODS, CAPACITY, EXPENDITURES. *(Entstaubungstechnik - Verfahren, Leistung, Aufwand). Text in German. Tech. Mitt., 67(11):478-484, 1974. (Presented at the Seminar on Dust Collection in Industrial and Commercial Plants, Haus der Technik, Essen, Germany, May 15, 1974.)*

Dust technology deals with dust particles whose sizes span a range of four decimal powers. The following basic processes are sources for dust emissions: crushing, classifying; sorting, mixing, and compacting processes; drying; combustion; roasting; melting; heat exchanging; transporting; storing; and surface treatment processes. A review of all available dust collection methods is given. Developments in the last few years have shown that the possibilities provided by centrifugal separators have not yet been fully exploited with regard to construction or application. Wet dust collectors are being used in nearly all industrial branches in a variety of designs. Dust filters come in round or rectangular casings with one or more chambers accommodating the filters in the form of tubular bags or envelopes. Synthetic or mineral filter materials have made dust filters applicable for dust collection in hot gases. Electrostatic precipitators come in horizontal or vertical design and operate dry or wet. The selection of the optimum dust collection method depends on the type of production process to be cleaned, on the mode of operation, the type, concentration and grain size distribution of dust particles to be separated, the temperature and humidity of the carrier gas and the desired and necessary collection efficiency, the available space and the possibilities of re-use of the separated dust. A graphical illustration of the investment costs for the various dust collection methods in dependence of the collection efficiency shows that equipment costs rise to various extents with increasing collection efficiency. The specific equipment costs change in dependence of the throughput; with increasing throughput the specific costs drop.

50563 **APTIC NO. 75221**

Epstein, M., L. Sybert, S. C. Wang, C. C. Leivo, and R. G. Rhudy

LIMESTONE AND LIME TEST RESULTS AT THE EPA ALKALI SCRUBBING TEST FACILITY AT THE TVA SHAWNEE POWER PLANT. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization, Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-a, p. 241-305, Dec. 1974. 7 refs. (Nov. 4-7.)*

NTIS: PB 242572/AS

Lime and limestone reliability testing at the Tennessee Valley Authority's coal-fired Shawnee facility revealed that scrubber internals remained relatively free of scale when the sulfate saturation of the scrubber slurry was kept below about 135%. This was accomplished with the proper selection of percent solids recirculated, effluent residence time, and liquid to gas ratio. The only significant reliability problem at the Shawnee facility was scaling and/or plugging of the mist eliminator systems. A mist elimination system using a Koch Flexitray with underside steam sparging in series with a chevron mist eliminator remained essentially clean over a 790-hour period at a superficial gas velocity of 8.6 ft/sec and 14% solids recirculated. Tests of a spray tower chevron mist eliminator with provision for underside and topside washing demonstrated operability of the elimination system for three months at a superficial gas velocity of 6.7 ft/sec and 8% solids recirculated, with intermittent or continuous bottomside washing. Tests with intermittent topside and bottomside washing indicated that operability of the mist elimination can be extended substantially beyond three months. (Author abstract modified)

50564 **APTIC NO. 75234**

Erdman, Donald A.

MAG-OX SCRUBBING EXPERIENCE AT THE COAL-FIRED DICKERSON STATION POTOMAC ELECTRIC POWER COMPANY. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 729-738, Dec. 1974. (Nov. 4-7.)*

Operating experience with a magnesia slurry venturi scrubbing process for the removal of particulates and sulfur dioxide from the flue gas of a 190 MW coal-fired steam generating unit is described. The scrubber system used was a two-stage type, with particulates being collected in the first stage and SO2 being absorbed in the second stage. Sulfur dioxide removal efficiencies of between 88 and 96% were attained for gas flows between 150,000 and 300,000 acfm. Particulate removal was in excess of 99%. Operating availability ranged from 43.5% to 60%, maintenance problems encountered involved corrosion leaks in rubber lined pipe, erosion leaks in second stage piping, pump seal problems, and bearing failure in sulfite bucket elevators. The capital cost of the scrubbing installation is an estimated $100/KW.

50565 **APTIC NO. 73084**

Farnsworth, J. Frank, D. Michael Mitsak, and F. J. Kamody

CLEAN ENVIRONMENT WITH KOPPERS-TOTZEK PROCESS. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 115-130, Oct. 1974.*

The Koppers-Totzek gasification process for the production of clean, desulfurized utility or synthesis gas is described. The process converts any rank coal or heavy liquid hydrocarbon into a gas whose composition is essentially carbon dioxide, carbon monoxide, and hydrogen. Sulfur appears as hydrogen sulfide and is recovered in a Claus unit. The gas produced can be used as low-Btu fuel, as feedstock for chemical synthesis, as reducing gas, or as pipeline gas after upgrading. The process produces only gas and slag; no liquid tars or hydrocarbons are generated. The heating value of the product gas is equivalent to 70-77% of the calorific value of the feedstock. Additional energy recovered as steam from the available sensible heat amounts to about 15% of the calorific value of the coal.

50566 **APTIC NO. 73031**

Feige, N. G.

CORROSION SERVICE EXPERIENCE AND ECONOMICS OF TITANIUM'S USAGE IN GAS SCRUBBING EQUIPMENT FOR REFUSE INCINERATORS. *Preprint, National Assoc. of Corrosion Engineers, Houston, Tex., 9p., 1974. 8 refs. (Presented at the National Association of Corrosion Engineers, Annual Meeting, Chicago, Ill., March 7, 1974.)*

The economics of titanium usage in gas scrubbing equipment serving refuse incinerators is considered in terms of laboratory corrosion test results and field operation experience. Titanium resistant to incinerator flue gas environments which contain such corrosive materials as hydrogen chloride, sulfur dioxide, sulfur trioxide, trace hydrogen fluoride, and organic acids. The resistance of the metal to attack is adequate over the pH range of 1.5-11 and up to temperatures of 230 F for general pitting attach and 165 F for crevice corrosion. Trace amounts of ferric ions in the system can extend the range of immunity to attack. Economic considerations favor titanium at either end of the scrubber. The inlet area is very sensitive to water flow and temperature flares from the incinerator; and, since the amount of surface is small in this corrosion area compared to the total unit, titanium is a reasonable cost/performance selection. Titanium is also economically favored for the induced-draft fan rotor assembly.

50567 **APTIC NO. 70543**

Flad, Johannes

MUNICIPAL PUBLIC WORKS OF SAARBRUECKEN EXPAND HEATING POWER STATION. *(Stadtwerke Saarbruecken erweitern Heizkraftwerk). Text in German. Energie (Munich), 26(11):391-400, Nov. 1974.*

The rising demand for remote heat supply made the expansion of the heating power plant in Saarbruecken necessary. After two years of intense examinations it was decided that a steam/gas power plant should be added. The waste gases of the gas turbine with a temperature of 500 C will be fed to a waste heat boiler where at full load of the gas turbine, 47 tons of steam/hr with 430 C and 30 bar pressure will be produced. This steam will be used in a steam turbine for the generation of 10 MW electric power. The steam quantity can be raised to 85 t/hr and the capacity of the steam turbine to 20MW through auxiliary burners installed in the waste heat boiler. A detailed description of the individual aggregates of the new plant is given. Measurements of the sulfur dioxide and dust background concentrations and calculation of the anticipated additional pollution by the new steam/gas power plant yielded an increase of the long-term and short-term SO2 emission concentrations by less than 0.02 and 0.06 mg/cu m. The increase of the dust fall in the vicinity of the plant will remain below the detection limit.

50568 **APTIC NO. 70600**

Fukuyama, J., H. Itoh, and A. Honda

THE REMOVAL OF MALODOROUS SULFUR-CONTAINING GASES BY ACTIVATED SLUDGE. *(Io-kei akushu gasu no kassei odei ni yoru jokyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):470, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 319.)*

An experimental deodorization device consisting of two aeration tanks containing activated sludge was developed, and its deodorization capability for sulfur malodors was tested. The removal rates of hydrogen sulfide and methyl sulfide were determined by measuring concentrations before and after the treatment using flame photometric gas chromatography. The removal rate by naturalized sludge was higher than that of unnaturalized sludge. The removal rates by activated sludge and distilled water were compared and the latter was extremely inferior. The effect of adding glucose to an aeration tank with an odor removal rate of above 99% resulted in an immediate deterioration of efficiency. The relationship between load and treatment efficiency was investigated, which indicated the removal rate of above 99.5% was achieved with load less than 13-15 mg/g/day for H2S and 10 mg/g/day for (CH3)2S.

50569 **APTIC NO. 70349**

Fukuzawa, Hisashi and Yoshimi Ishihara

CATALYTIC REDUCTION OF NITROGEN OXIDES BY AMMONIA--THE ACTIVITY OF METAL OXIDE CATALYSTS. *(Anmonia ni yoru sanka chisso no sesshoku kangen--kinzoku sankabutsu shokubai no katsusei). Text in Japanese. Preprint, Japan Chemical Society, Sendai, p. 654, 1974. (Presented at the Japan Chemical Society, Fall Meeting, 31st, Sendai, Japan, Oct. 2-5, 1974, Paper 2Q16.)*

The effectiveness of various metal catalysts was studied for contact reduction of nitrogen oxides by ammonia. When sulfur dioxide was not present, reduction activity was high for copper, iron, chromium, cobalt, and vanadium systems. A removal rate of over 70% for nitric oxide occurred, with maximum activity occurring from 100-200 C. In the presence of SO2, some systems (Cu, Cr, V) exhibited higher NO removal rates (80-90% at 250-400 C), while other systems (Fe, Co-Cr) showed decreased activity (55% for Fe at 300 C, no activity for Co-Cr).

50570 **APTIC NO. 71016**

Fukuzawa, Hisashi and Yoshimi Ishihara

CATALYTIC REDUCTION OF NITRIC OXIDE BY CARBON MONOXIDE: ACTIVITIES OF CATALYSTS IN THE SYNTHETIC GAS. *(Issanka tanso niyoru sanka chisso no sesshoku kangen: gosei gasu niyoru shokubai no kento). Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Daichi Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. (No. 1) Electric Power Ind., Rept.), No. 73102:1-24, June 1974. 8 refs.*

Dry catalytic reduction processes developed for removing nitrogen oxides from combustion flue gases are described. About 70 different catalysts are examined. Basically catalysts are categorized as alumina-silica catalyst on different metal supports, bauxite on different metal support, and metal oxides. After filling a reaction tube with 6 ml of catalyst, synthetic gas was sent through and denitrification efficiency was compared under different experimental conditions such as gas space velocity, reaction temperature, and concentration of gases. For the alumina-silica catalyst on a metal support, the best denitrification efficiency was obtained when noble metals were used as the support, followed by copper, chromium, iron, and cobalt, respectively. The noble metals coud be used also at low reaction temperatures (200-600 C), and 90% efficiency was achieved. Copper could be used in 300-650 C region giving 80% efficiency. For the bauxite catalysts, 80% efficiency was obtained when copper-chromium support was used at 300-600 C. The efficiency decreased for chromium, copper, zinc, and cobalt, respectively. For the metal oxide catalysts, copper-chromium- barium, copper-zinc oxides system gave 80% efficiency at 250-450 C. The copper-chromium-magnesium catalyst was the most effective at a high space velocity. The activity of bauxite did not decrease in the presence of sulfur dioxide. A platinum catalyst reduced nitric oxide selectively, even though oxygen was present in the flue gas.

50571 **APTIC NO. 75216**

Gage, Stephen

FLUE GAS DESULFURIZATION AND OTHER ALTERNATIVES FOR PRODUCING ELECTRICITY FROM COAL. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization, Proc. Symp., Atlanta, a., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-a, p. 5-15, Dec. 1974. Nov. 4-7.)*

NTIS: PB 242572/AS

Goals of the Environmental Protection Agency s research and development program on flue gas desulfurization are outlined. Anticipated research projects include: an advanced lime/limestone test program at the Tennessee Valley Authority s Shawnee plant, a full-scale demonstration of the double alkali process, and a full-scale demonstration of a regenerable flue gas desulfurization system which produces by-product sulfur. Alternatives to flue gas desulfurization are also discussed, with particular reference being made to coal liquefaction and gasification as well as fluidized-bed combustion.

50572 **APTIC NO. 70218**

Gall, Robert L. and Edmund J. Piasecki

REMOVING SO2 FROM STACK GASES BY A DOUBLE ALKALI WET SCRUBBING PROCESS. *Preprint, American Inst. of Chemical Engineers, New York, 20p., 1974. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 67th, Washington, D. C., Dec. 1-5, 1974.)*

A double-alkali system for removal of sulfur oxides was studied on a full-scale power plant to allow the plant to continue to burn high-sulfur coal and to test the effectiveness of the method. The process chemistry, equipment criteria and performance and costs are discussed. After 9 months of operation, the double- alkali process had operated without major difficulties. The chemistry of the process demonstrated in the pilot operation proved itself in the full-scale plant with the exception of lime utilization. Efforts are underway at the present time to improve this. The equipment selected with minor exception proved itself capable of handling the slurries and sludge involved in the system. The materials of construction proved satisfactory, with only minor difficulties. The system was able to remove sulfur dioxide from flue gases. Costs were higher than anticipated, but efforts are being made to reduce these. Total capital cost was $3.2 million. (Author summary modified)

50573 **APTIC NO. 73082**

Gibson, Cecil R., Gene A. Hammons, and Don S. Cameron

ENVIRONMENTAL ASPECTS OF EL PASO S BURNHAM I COAL GASIFICATION COMPLEX. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 91-100, Oct. 1974. 2 refs.*

A proposed coal gasification complex based on Lurgi technology is described that is designed to convert 28,254 tons of coal/day into 288 million standard cu ft/day of synthetic natural gas. Oxygen-blown Lurgi gasifiers are used to produce a medium-Btu (320 Btu/standard cu ft) gas from coal; the medium Btu gas is then converted to synthetic natural gas (pipeline quality) via shift conversion, gas cooling, Rectisol treatment, and methanation. The bulk of the inlet sulfur (about 95%) is converted to hydrogen sulfide in the gasifier. Organic sulfur is primarily in the form of mercaptans. Before any of the sulfur compounds are removed, a portion of the raw synthesis gas is passed through a Lurgi Crude Gas Shift Unit. The converted gas from the shift and the crude gas bypass are recombined and cololed prior to the gas purification step. Purification is performed in a Lurgi Rectisol unit, with H_2S and organic sulfur compounds being reduced to less than 0.2 ppm by volume. Hydrogen cyanide can also be removed by the Rectisol unit. Overall sulfur recovery is about 99%. Particulates from the gasifier are controlled with a water scrubber, and fugitive emissions from coal handling are controlled by wetting. The absence of fuel nitrogen combined with reduced flame temperatures (both in the turbine and waste heat boiler) allows for Federal and state nitrogen oxides emission standards to be met.

50574 **APTIC NO. 70608**

Gipp, Rudolf

POSSIBILITIES OF ENERGY RECUPERATION IN REFINERIES. *(Moeglichkeiten der Energierueckgewinnung in Raffinerien). Text in German. Erdoel Kohle-Erdgas - Petrochem., 27(12):789-791, Dec. 1974.*

Special efforts are necessary to make better use of energy in all process steps and to reduce the pollutants in the waste streams in refineries. Two measures are described which, apart from energy recuperation, also lead to reduction of atmospheric pollution through carbon monoxide and other waste gases. Since the waste gas from the catalytic cracking station with an overpressure of 1.7 to 2 bar, a temperature of 620 C, and a carbon monoxide content of 6 to 8% is a potent energy carrier, it was decided to recover this energy in three steps, first removing the remaining catalyst dust in a collector comprising 16 individual cyclones connected in parallel. The grain size of the catalyst dust ahead of the cyclone ranges from 2 to 35 micron. The collection efficiency of the dust collector for the 2 micron dust is 60% and for the 35 micron dust 100%. The gas leaves the collector with a residual dust content of 190 mg/cu m and grain sizes not exceeding five micron. For heat recuperation and pressure release, the gas now goes to a multistage reaction turbine where it leaves with a temperature of 450 C and an overpressure of about 50 mbar. In the following steam boiler the carbon monoxide is burned either catalytically or thermally. A harmless waste gas containing nitrogen, carbon dioxide, and water vapor leaves the stack with 200 to 250 C. The second example of energy recuperation involves the flare gases which are drawn on by a rotational compressor where they are condensed and used as fuel for the boilers of the refinery-owned power plant.

50575 **APTIC NO. 73077**

Given, P. H.

PROBLEMS IN THE CHEMISTRY AND STRUCTURE OF COALS AS RELATED TO POLLUTANTS FROM CONVERSION PROCESSES. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 27-34, Oct. 1974. 26 refs.*

Probable pollution problems that will arise in coal conversion processes are discussed. Predictions are made based on details of individual conversion processes including ancillary operations; knowledge of the organic and inorganic constituents of coals, and geochemistry of the different major coal-producing areas of the country. The principal types of minerals in coals are clays, quartz, carbonates, pyrite, and sometimes feldspars. Potentially polluting trace or minor elements may be associated with any of these or with the organic matter. The fate of these elements in conversion processes depend on the nature of the association of each element as well as on its chemical properties, but available data on trace elements in coals do not include information on the type of association. Existing knowledge of the chemistry, geochemistry, petrography, and mineralogy of coals should be reviewed in relation to conversion technology in such a way as to facilitate predictions of potential pollution problems. (Author abstract modified)

50576 **APTIC NO. 71051**

Gospodar, Rfinhard

COMBUSTION ENGINE WITH ADDITIONAL AIR INLET VALVE. *(Volkwagenwerk Aktiengesellschaft, Wolfsburg (West Germany)) U. S. Pat. 3,814,065, 4p., June 4, 1974. 2 refs. (Appl. Nov. 27, 1970, 4 claims).*

A combustion engine equipped with an additional air-inlet means and a control arrangement for closing and opening the inlet is described that results in more efficient combustion and favorable limitation of carbon monoxide and nitrogen oxide formation. The scope of the invention covers cylindrical, lifting, or rotary piston arrangements. The additional air inlet and its associated cam controlling device allow for a predetermined quantity of pressurized air from an associated pressurized air producer to be introduced into the combustion chamber between the time of firing and the end of the power stroke. As a result, the combustion temperature becomes lower and the combustion of those fuel components for which there was no oxygen provision in the original fuel-air mixture becomes possible.

50577 **APTIC NO. 71056**

Gothard, Nicholas

METHODS OF AND APPARATUS FOR SEPARATING SOLID AND LIQUID PARTICLES FROM AIR AND OTHER GASES. *(Assignee not given.) U. S. Pat. 3,818,678, 28p., June 25, 1974. 3 refs. (Appl. Dec. 15, 1972, 12 claims).*

An electrostatic precipitation method for the removal of particles from gas streams via a non-uniform electric field is described which achieves shorter collection times and higher efficiencies than similar devices through reductions in drag forces. In contrast to prior-art devices, a small current flow from one to the other of two conductors is deliberately established to ionize a small number of gas molecules flowing through the non-uniform electric field. These molecules act as sites about which uncharged particles tend to cluster and form ensembles of gas molecules. The ensembles or aggregates of molecules are acted on collectively by non-uniform electric field and are moved toward the high intensity region of the field. The force is appreciably greater than that which can be exerted on a single gas molecule, and substantial velocities can be imparted to the ensembles. The ionizing current is kept sufficiently low so that particles of material being separated are not charged to the point where they move by electrophoresis.

50578 **APTIC NO. 73085**

Grace, R. J. and E. K. Diehl

ENVIRONMENTAL ASPECTS OF THE BI-GAS PROCESS. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 131-134, Oct. 1974. 1 ref.*

The BI-GAS process for coal gasification is reviewed, with particular emphasis on its environmental advantages. All types of coal appear to be amenable to thee process without special preparation since thee process employs an entrained rather than a fixed- or fluidized-bed system. All feed coal is consumed in the process, and the principal by-products are slag and elemental sulfur. Essentially all of the sulfur in the coal is removed as hydrogen sulfide which in turn is converted to elemental sulfur in a Claus unit. The reactive components in the coal are completely used in the process, and the ash for disposal is in the form of a granular vitreous material. The vitreous nature of the slag minimizes the possibility of water-leaching in the event that the material is returned to the mine site or is used elsewhere as land fill.

50579 **APTIC NO. 70595**

Hanatani, S.

POLLUTION CONTROL OF FLARE SYSTEM. *(Totaru furea shisutemu ni yoru kogai boshi). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):445, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 296.)*

A total system for the recovery of flare gas and for the effective utilization of waste energy was designed and examined. The system consisted of three measures; flare gas classification, reduction, and recovery as boiler fuel; treatment of hydrogen sulfide-containing gas and improvement of the burner tip of the flare stack; and grand flare installation. Flare gases were classified and evaluated for their composition and pressure. Gases with low flow rates (300-700 cu m/hr) were recovered as boiler fuel by using a compressor. Results of a 4-month operation revealed that approximately 5000 kl of heavy oil could be saved per year.

50580 **APTIC NO. 73088**

Harrison, W. B.

ENVIRONMENTAL ASPECTS OF SOLVENT REFINING. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 165-167, Oct. 1974.*

The advantages of solvent refining over coal gasification or flue gas treatment in the production of electric power from high-sulfur bituminous coal are reviewed. The sulfur removed during solvent refining (or coal gasification) may leave the process either as concentrated sulfuric acid or elemental sulfur, depending on the potential markets for either form; whereas flue gas treatment dictates the chemical form of the sulfur produced by the nature of the process used. Solvent refining as opposed to the other two alternatives allows for the freedom of locating the processing plant at whatever location appears to be most feasible with respect to the source of coal; it also offers transportation savings not applicable to gasification. Solvent refining additionally offers an alternative to premature obsolescence of power plants since retrofitting can be accommodated with very small modifications. In contrast with low-Btu gas, solvent refined coal can be readily stored and used as needed, thus allowing for operation at maximum production efficiency.

50581 **APTIC NO. 70702**

Hayashida, S., M. Wasamoto, and N. Fukami

SECONDARY AIR INJECTION DEVICE FOR MULTI-PISTON ROTARY ENGINE. *(Tarotari pisuton enjin no niji kuki chunyu sochi). Text in Japanese. (Toyo Kogyo Co., Ltd., Hiroshima (Japan)) Japan. Pat. Sho 49-43742. 3p., Nov. 22, 1974. (Appl. March 31, 1971, 1 claim).*

For the reduction in toxic components such as hydrocarbons and carbon monoxide in rotary engine exhaust gases, a common secondary air injection system with openings to each combustion chamber at positions near the exhaust port is placed in the side housing. The amount of air injected is controlled automatically by the pressure difference in the exhaust port due to the phase difference of rotors attached to a common eccentric rod with a 180 deg phase difference. Concentrations of fuel and incompletely combusted components are lower at the leading side of compression chamber and higher at the following side. In this system, the amount of air injected is automatically increased with rotation of rotor, injecting more air at the following side for efficient combustion.

50582 **APTIC NO. 70202**

Henderson, James M. and John B. Pfeiffer

LIQUID SO2 FROM COPPER CONVERTER GASES THE ASARCO DIMETHYLANILINE PROCESS. *Preprint, American Inst. of Chemical Engineers, New York, 15p., 1974. (Presented at the American Institute of Chemical Engineers, National Meeting, 78th, Salt Lake City, Utah, Aug. 18-21, 1974.)*

The production of liquid sulfur dioxide from copper converter gases at the American Smelting and Refining Co. (ASARCO) smelter in Tacoma, Wash. is described. Total recovery of sulfur from the facility either as liquid SO2 or sulfuric acid amounts to 51% of smelter input and enables the plant to comply with all existing ambient air standards for SO2. The SO2 is absorbed in dimethylaniline and the SO2 is stripped from the loaded absorbent. Absorbent loading varies from 140 to 160 g of SO2/l. The dimethylaniline vapor is recovered both from the SO2 impoverished smelter gas stream and the concentrated SO2 leaving the stripper. The concentration of SO2 is dried, compressed, and condensed to form a high purity liquid product that contains under 50 ppm of both water and nonvolatile residue. (Author abstract modified)

50583 **APTIC NO. 70555**

Henderson, James N.

ENVIRONMENTAL OVERKILL--THE NATURAL RESOURCE IMPACT. *Mining Congr. J., 60(12):18-23, Dec. 1974.*

The consequences of sulfur dioxide controls are discussed which can lead to debasements of the environment and be wasteful of energy and other natural resources. The Environmental Protection Agency has apparently concluded that there is a limit on SO2 control costs of 3 cents/lb of copper which can be considered reasonable for domestic primary copper smelting. Treatment of the large volumes of relatively dilute reverberatory furnace gases generated in the typical copper smelter is thus not economically feasible, even if a number of developing techniques for recovery of SO_2 or sulfuric acid from such dilute gas streams were fully developed. A new source performance standard has been provisionally proposed which in effect will prohibit use of reverberatory furnaces in copper smelters of the future. This proposal is justified on the basis that large-scale hydrometallurgical processing of copper concentrates is a potentially promising substitute for pyrometallurgical treatment of copper-bearing materials and that flash smelting and electric furnaces are proven alternatives to the reverberatory furnace. However, this justification is not necessarily correct. Flash smelting is not a universally acceptable reverberatory furnace substitute. By forcing flash smelting as an alternative to the reverberatory furnace, the new source performance standard would restrict disposal of abatement-derived H_2SO_4 in a way which at the same time contributes to continuing needs for copper. Experience with large electric furnaces is limited, and the new standard would require that copper concentrates of high volatile impurity content, lead smelter by-products, and, to a certain extent, cement copper very largely must be smelted in electric furnaces. The increased use of electric furnaces would increase electric power use and mining of coal to fuel power stations. The energy requirements for smelting and refining copper are reviewed; electric furnaces would require the highest energy consumption, and calcine charged reverberatory furnaces would have an energy advantage. Most hydrometallurgical processes are energy intensive. Thus, the proposed EPA standard conflicts with energy conservation. An intermittent control system should be used which encourages recovery of sulfur from the waste gas streams in a useful form.

50584 **APTIC NO. 73087**

Hinderliter, C. R.

ENVIRONMENTAL ASPECTS OF THE SRC PROCESS. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 159-164, Oct. 1974.*

Solvent refining of coal is described along with potential pollutant streams and methods for their control. The process involves first dissolving coal under moderate hydrogenn pressure in a heavy aromatic solvent. The resultant coal solution is then filtered to remove ash and a small amount of insoluble organic material; fractionation is performed to recover the solvent. The product is a heavy residual fuel that contains less than 0.8% sulfur and less than 0.1% ash. The yield from thee process is about 60 wt%; in addition, about 15% of the coal is converted into light liquids and gases. Fugitive dust emissions resulting from the handling of coal appear to be controllable by the use of covered conveyors and induced draft vents, with the vent gas being filtered to remove particulates. Sulfur liberated from the solvent refining process as hydrogen sulfide can be converted to elemental sulfur using a Claus sulfur plant along with an appropriate tail gas cleanup unit; recoveries of between 99 and 99.5% appear possible. Spent gas from the tail gas unit can be incinerated to insure the conversion of unrecovered H_2S to sulfur dioxide prior to venting to the atmosphere. The design of fired heaters for compliance with nitrogen oxide emission standards does not appear to be a difficult problem. (Author abstract modified)

50585 **APTIC NO. 70653**

Hirose, Koji and Tadao Fujiwara

A STUDY OF DUST ABATEMENT BY COMBUSTION. *Mem. School Eng., Oakayama Univ., 9(1):1-9, July 1974. 3 refs.*

The abatement of dust produced by wood combustion is discussed. An afterburner is attached to the wood-burning furnace used in the manufacture of Bizen Yaki. The exhaust gases containing combustible dust can be destroyed effectively by the afterburner with efficiency of about 80%. The design of the experimental apparatus and experimental results are discussed. The afterburner disposal of dust is designed with a low residence temperature and long holding time to take care of heat transfer and the ignition temperature for the dust. It is economical in fuel consumption. The air rate from the burner attending hold is carefully controlled to reduce fuel consumption and to operate the furnace optimally.

50586 **APTIC NO. 70570**

Hishinuma, Takao and Zensuke Tamura

INDUSTRIAL FLUE GAS DESULFURIZATION METHOD. *(Kogyoyo haigasu datsuryu hoho). Text in Japanese. (Hitachi Co., Tokyo (Japan)) Japan. Pat. Sho 49-27945. 2p., July 22, 1974. 2 refs. (Appl. Aug. 15, 1966, 1 claim).*

An improved desulfurization process for industrial exhaust gases, using activated charcoal, is described. In order to obtain maximum use of the activated charcoal, the processes of low-temperature absorption, high-temperature absorption, desorption by high-temperature inactive gas, and cooling are carried out simultaneously. The various processes are repeated continuously as the charcoal is recycled. The charcoal is passed through a columnar structure from top to bottom. From the top, the following stages exist: 100 C absorption layer; 200 C absorption layer; 400 C inactive gas (nitrogen, carbon dioxide) desorption layer; and 100 C cooling layer. The regenerated activated charcoal is then recycled to the 100 C absorption layer. The industrial waste gases are passed, in order, through the 200 C absorption layer, then the 100 C absorption layer, to remove the sulfur oxides. After desorption and washing, the concentration of sulfur dioxide is below 100 ppm in the gases emitted into the atmosphere. In the cooling process, the activated charcoal is cooled directly with jet streams of water. The steam which arises during the cooling is forcibly removed from the activated charcoal by means of extraction with inactive gas, supplied at the same time as the water jets. This procedure regenerates the charcoal by cooling it uniformly, meanwhile leaving enough moisture on the charcoal for optimum absorption.

50587 **APTIC NO. 70678**

Hishinuma, Takao and Zensuke Tamura

INDUSTRIAL FLUE GAS DESULFURIZATION DEVICE. *(Kogyoyo haigasu datsuryu sochi). Text in Japanese. (Hitachi Co., Tokyo (Japan)) Japan. Pat. Sho 49-27946. 3p., July 22, 1974. 2 refs. (Appl. Sept. 21, 1966, 1 claim).*

A schematic diagram of a scrubber which removes sulfur oxides from industrial flue gases is presented and described. An internal column contains activated charcoal which is moved through the various stages from top to bottom, and can be replenished when necessary. The column contains the following stages, from top to bottom: low-temperature (100 C) absorption layer for sulfur dioxide; high-temperature (200 C) absorption layer for sulfur trioxide; high-temperature (400 C) desorption layer, using high- temperature (400 C) inactive gas; and cooling (100 C) layer. The charcoal is recycled by an elevator from the cooling layer to the 100 C absorption layer at the top. The exhaust gases are passed upward, first through the 200 C absorption layer and then through the 100 C absorption layer, before expulsion into the atmosphere. In the 400 C desorption layer, nitrogen or carbon dioxide gas desorbs the SO_2 or SO_3 from the activated charcoal. The carrier gases are recovered by washing with water and recycled. Water jets are arranged at the upper part of the cooling stage. Inactive gas is supplied from the bottom of the stage. The inactive gas forcibly removes the steam arising from the hot activated charcoal in contact with the water jets. The extracted gas is condensed to remove the water content, and the cleaned, inactive gas is recycled. The charcoal, now at a temperature of 100 C, is conveyed to the low-temperature absorption stage to begin its recycling process.

50588 **APTIC NO. 70762**

Hiwatari, A.

COMBUSTION METHOD FOR AMMONIA. *(Anmonia no nensho hoho). Text in Japanese. (Nittetsu Kako Machinary, Tokyo (Japan)) Japan. Pat. Sho 49-42749. 3p., Nov. 16, 1974. (Appl. Dec. 12, 1970, 2 claims).*

The use of ammonia as a boiler fuel and control method for NH_3 combustion gas are described. In the case of NH_3 gas, during combustion at an air ratio of less than one, the amount of nitrogen oxides produced is negligible due to the extremely low oxygen concentration in the combustion gas, in spite of flame temperatures as high as 1500 C. However, such low oxygen concentration results in an increase in the amount of unreacted NH_3. If the air ratio is increased for the purpose of reducing the amount of unreacted NH_3, the amount of NO_x is increased. Therefore, in primary combustion, the air ratio is maintained at less than one, and in the secondary combustion the additional air is added for the combustion of unreacted NH_3 while maintaining the temperature in the range where NO_x formation is minimized. This temperature range varies with the purity of NH_3 gas and air ratios. For example, in the case of using NH_3 gas containing 20 vol% of steam as a boiler fuel, NO_x and unreacted NH_3 concentrations are in the range of 50-100 ppm when the primary combustion air ratio is 0.9, flue temperature is approximately 1000-1200 C, and the secondary combustion air ratio is 0.2.

50589 **APTIC NO. 73053**

Holmberg, J. D.

DRIFT MANAGEMENT IN THE CHALK POINT COOLING TOWER. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 128-146, 1975. 9 refs. (March 4-6.)*

Laboratory and field tests were performed to apply theoretical principles of water and air handling and of particle transport to the management of drift and salt deposition from a cross-flow natural-draft cooling tower. The use of a Duplex eliminator instead of a sinusoidal-wave eliminator resulted in improvements in deposition rate. Other factors contributing to overall drift reduction and decreases in the population of large particles included the extensive spacing between the fill and eliminator and the fallout occurring in the plenum of the hyperbolic tower.

50590 **APTIC NO. 70350**

Hori, Shoichiro, Rokuzo Nakagawa, and Kaoru Aoki

MANUFACTURING METHOD FOR ANHYDROUS SODIUM SULFATE. *(Musui ryusan soda no seizoho). Text in Japanese. (Nihon Sangyo Gijutsu KK Tokyo (Japan)) Japan. Pat. Sho 49-39000. 3p., Oct. 22, 1974. 3 refs. (Appl. May 26, 1970, 1 claim).*

A method for manufacturing anhydrous sodium sulfate from sulfur dioxide recovered from high-temperature industrial waste gases is described. The economy of operation is affected when heat present in the industrial waste gases and the heat released during the oxidation of sodium sulfite are used in the concentration of sodium sulfate solution to form anhydrous sodium sulfate. High-temperature industrial waste gases containing SO_2 are washed and cooled with sodium sulfate solution to remove dust and sulfur trioxide. The concentrated wash solution is neutralized and purified. One portion is recycled, and another portion is treated by high-pressure oxidation. The cleaned gases are treated with a solution of alkaline sodium compounds to form a sodium sulfite solution, after initially forming acidic sodium sulfite solution. A slurry of anhydrous sodium sulfate crystals is formed by high-pressure air oxidation of sodium sulfite solution. The slurry is filtered, and the anhydrous sodium sulfate crystals are separated. The filtrate (sodium sulfate solution) is recycled.

50591 **APTIC NO. 70503**

Imaizumi, Toshimichi

EXAMPLES OF LOCALIZED EXHAUST SYSTEMS FOR ELECTROLYSIS TANKS. *(Denkaiso kyokusho haiki sochi no sekkeirei). Text in Japanese. Anzen Kogaku (J. Japan. Soc. Safety Eng.), 13(5):336-343, Oct. 1974.*

The design of an exhaust system of the duct confluence type with control wind speed to insure total removal of harmful mists is given. The system is composed of six hoods, each hood duct connecting to a main duct extending to an absorbing tower through the wall of the building. The wind velocity in hood ducts 1-4 was set at 14.79 m/sec and that in hood ducts 5 and 6 was set at 16.27 m/sec. The total pressure loss was 130 mm water including 40 mm H_2O from the hood ducts to the absorbing tower, 50 mm H_2O for the absorbing tower, and 40 mm H_2O from the absorbing tower to exhaust exit. The wind velocities were set to insure complete removal of the highly corrosive and toxic vapor and mist from the electrolytic solution.

50592 **APTIC NO. 70683**

Ishihara, Kenji, Tatsuo Tanaka, and Yoshiyuki Toyama

REMOVAL OF TETRAETHYL LEAD FROM GASOLINE-KEROSENE MIXTURES. *(Gasorin-toyu kongobutsu kara no shi echiru namari no jokyo). Text in Japanese. Toyo Daigaku Kogakubu Kenkyu Hokoku (Res. Rep. Fac. Eng., Toyo Univ.), no. 9:31-39, Oct. 1974.*

Gasolines I, II, and kerosene containing 0.25 g/l, 0.22 g/l, and 0 g/l of lead, respectively, and their mixtures were used for the study of Pb removal by extraction with mineral acids or by adsorption on activated clay. To a separatory funnel containing 100 ml of the acid, was added 100 ml of gasoline, kerosene, or their mixture (gasoline:kerosene ratios of 3:1, 1:1, and 1:3). The sample was shaken at 160 times/min for a given period of time and was ashed with water until the washing water became neutral with methyl orange as an indicator. The mixture was then filtered and heated to a given temperature. By the adsorbing method, a 45 cm by 2.5 cm i.d. glass column was packed with a given quantity of activated clay previously heated at 110 deg for 2 hr. The sample was poured at room temperature at a rate such that the solution above the column was kept at 35 cm high. The eluted solution was collected, and lead was analyzed by the JIS K 2260 method. The acid treatments showed that 52% and 88% of Pb were removed by using concentrated sulfuric acid for 25 min and concentrated nitric acid for 30 min, respectively. Diluted acid gave approximately 20% rate of removal. A column with 5 g of the clay powder removed 72% of the Pb, but columns packed with 10, 12, 19, and 32 g removed 100% of the total Pb in the fuels.

50593 **APTIC NO. 71052**

Ishihara, Shinya and Yoshihiro Suzuki

AIR PUMPS FOR AN ENGINE EXHAUST GAS CLEANING SYSTEM. *(Nippondenso Co., Ltd., Aichi (Japan)) U. S. Pat. 3,819,308. 8p., June 25, 1974. 5 refs. (Appl. Oct. 20, 1972, 5 claims).*

An air pump for an automobile engine exhaust gas cleaning system is described that eliminates the size limitations of conventional arrangements through unitary construction with its driving generator. The pump is directly driven by the generator shaft but at a lower speed. A gear means for transferring the rotation of the generator to the rotor of the air pump consists of a pinion gear secured to the generator shaft and an internal gear engaging with the pinion gear and secured to the air pump rotor.

50594 **APTIC NO. 70655**

Ishikawa, Noboru

RESULTS OF EMULSION COMBUSTION TESTS AS AN NOX CONTROL MEASURE. *(NOx teigen taisaku to shite no emarujon nensho shiken kekka ni tsuite). Text in Japanese. Kyushu Denryoku Sogo Kenkyusho Kenkyu*

Kiho (Bull. Res. Inst. Kyushu Elec. Power Co., Ltd.), vol. 42:37-42, Sept. 1974.

In addition to two-stage combustion and combustion gas recycling which have been effective for reducing 35-40% of NOx, emulsion combustion using a fuel-water mixture was tested for further NOx reduction. Water was introduced into fuel pipe through a by-pass at a ratio of 10% to 30% water. The NOx in boiler waste gas was measured by a monitor using contant-voltage electrolysis method, and NOx in waste gas at the entrance of stack was measured by a monitor using the chemiluminescent method. At normal conditions with 4% oxygen and 26% water, NOx concentrations at the fuel economizer exit and stack entrance were reduced from 392 ppm and 366 ppm to 348 ppm and 312 ppm, respectively, a reduction of about 11%. At 3/4 load and 26% water, NOx at the stack entrance was reduced from 323 ppm to 233 ppm, a reduction of 28%. The NOx concentration at the stack entrance could be further reduced to below 200 ppm by an optimum operating condition accompanied with the addition of water.

50595 **APTIC NO. 70536**

Jahn, G.

DUST COLLECTION SYSTEMS IN INDUSTRY. *(Entstaubungsanlagen in der Industrie). Text in German. Tech. Mitt., 67(11):490-495, Nov. 1974. (Presented at the Seminar on Dust Collection in Industrial and Commercial Plants, Haus der Technik, Essen, West Germany, May 15, 1974.)*

After a review of the operating principles of cyclones, wet dust collectors, dust filters, and electrostatic precipitators, a comparison of the various dust cleaning situations arising at the dry cement process and the electric melting process, along with a discussion of the applicable dust cleaning methods is given. For example, the waste gases from the electric melting process are too dry for electrostatic precipitation and too hot for dust separation by cloth filters. For electrostatic precipitation, a method has been found which uses the sludge from spray cooling for wetting the dust. A comparison of installation costs between electrostatic precipitator and a cloth filter shows that the two differ only by 11%. The costs for energy are about the same for both methods.

50596 **APTIC NO. 73091**

Jahnig, C. E., E. M. Magee, and C. D. Kalfadelis

OVERALL ENVIRONMENTAL CONSIDERATIONS OF CONVERSION TECHNOLOGY. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 197-201, Oct. 1974. 8 refs.*

The environmental effects of applying conversion technology to upgrade fuel are discussed. Air effluents include sulfur and nitrogen oxides, hydrocarbons, odors from phenols and ammonia, and particulates. A single S removal system that would take out all forms of S present in the raw gas is not available. Characteristics of S removal techniques are listed for MEA, higher amines, carbonates, Claus plant, absorption/oxidation, and sulfur guard. Comparisons are needed between the emission standards and actual plant effluents, many of which are not completely defined at this time. Engineering modifications and improvements can be made in the type of coal drying and in the fuel to be fired in the coal dryer. Many gasification processes generate other chemical compounds as phenol, cyanides, and tars.

50597 **APTIC NO. 75242**

Jones, Julian W.

ENVIRONMENTALLY ACCEPTABLE DISPOSAL OF FLUE GAS DESULFURIZATION SLUDGES: THE EPA RESEARCH AND DEVELOPMENT PROGRAM. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga.,1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 887-927, Dec. 1974. 17 refs. (Nov.4-7.)*

An assessment of the environmental and economic factors associated with the disposal of sludge from non-regenerable flue gas desulfurization processes is presented along with a review of Environmental Protection Agency research programs dealing with environmentally sound disposal techniques. Lime/limestone scrubbing processes are expected to comprise the majority of flue gas desulfurization installations on power plants through 1980, producing approximately 35,000,000 short tons (dry, excluding coal ash) of sludge annually by 1980. Environmental Protection Agency research to date indicates that the most practical disposal techniques are landfilling of chemically fixed sludge and disposal of untreated sludge in ponds lined with impervious material such as clay, plastic, or rubber. Disposal costs estimates range from $2 to $9/ton(wet, 50% solids). Although less expensive than fixation, ponding may cause subsequent land reclamation costs to be incurred. Current research by the EPA also includes the migration of chemical constituents from sludges through the soil, the leachabilityand durability of raw and chemically fixed sludges, and the water pollution and reuse potential of treated and untreated scrubber liquors. (Author abstract modified)

50598 **APTIC NO. 72970**

Jonke, A. A.

REDUCTION OF ATMOSPHERIC POLLUTION BY THE APPLICATION OF FLUIDIZED-BED COMBUSTION (MONTHLY PROGRESS REPORTS). *Atomic Energy Commission, Argonne, Ill., Argonne National Lab., Environmental Protection Agency Interagency Agreement EPA-IAG-0199 and Office of Coal Research Contract 14-32-0001-1543, Repts. 62, 63, 64, 65, 66, 67, and 68, 244p., Oct. 1974. 19 refs.*

NTIS: PB 235840

A series of six monthly reports describing the development of advanced technology in pressurized, fluidized-bed combustion of coal and the investigation of the effects of operating variables on combustion efficiency, sulfur retention efficiency, and flue gas composition are presented. The fluidized-bed process is studied in terms of calcium carbonate (limestone) utilization, the reaction kinetics of sulfur fixation, the combustion of low-sulfur coal, and the relationship of low sulfur coal and operating variables to sulfur dioxide, methane, nitric oxide, nitrogen dioxide, carbon monoxide, and particulate levels in the flue gas.

50599 **APTIC NO. 70219**

Kaplan, Norman

AN OVERVIEW OF DOUBLE ALKALI PROCESSES FOR FLUE GAS DESULFURIZATION. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., 71p., 1974. 16 refs. (Presented at the Flue Gas Desulfurization Symposium, Atlanta, Ga., Nov. 4-7, 1974.)*

The chemistry, process design, development, and full scale application of sodium/calcium double alksli systems for flue gas desulfurization are reviewed. Based on the initial performance and reliablility demonstrated in various double alkali pilot plants and in an increasing number of full scale applications in the United States and Japan, it appears that this technology will soon become a viable alternative throwaway process to the lime/limestone processes. Total operating and planned full-scale and prototype utility and industrial applications of double alkali technology now number 17, with the total gas flow control equivalent to 2375 MW of electric generating capacity. Over 99% sulfur dioxide removal is achievable with lower than 10 ppm SO2 concentration in the treated flue gas. Potential waste disposal problems exist with the double alkali process due to the presence of a certain amount of soluble sodium salts which can cause water pollution problems. Development of a sludge fixation technology to change the wet solid waste product to a hard unleachable solid can conceivably reduce this potential problem. Actual costs for full scale utility boiler applications are not available, though estimates put double alkali capital costs in the lime/limestone range.

50600 **APTIC NO. 68702**

Kawakita, Shirou and Niichi Hayashi

REDUCTION OF NOX IN AUTOMOTIVE EXHAUST GAS (II). *(Jidosha haiki gasu no chisso sankabutsu (NOx) kaishu ni kansuru kenkyu (II)). Text in Japanese. Aichi Kogyo Daigaku Kenkyu Hokoku (Bull. Aichi Inst. Technol.), no. 9:87-90, March 1974.*

The possibility of reducing nitrogen oxides in automotive exhaust gas by reactions with sodium hydroxide was studied. The effect of reaction time, the effect of a cooling pipe for exhaust gas, and the relationship between temperature and NOx concentration were investigated. An NaOH tank with four compartments, designed to prolong reaction time, was used and reduction rates were compared with data from a single-compartment tank. The reduction rate in NOx was higher because of the longer reaction time; however, the back pressure was increased. The effect of an exhaust gas cooling pipe was evident at rotational frequencies above 1700 rpm, which produced a higher temperature. The conversion of nitric oxide to nitrogen dioxide takes place at a lower temperature which requires cooling of exhaust gas at higher temperatures.

50601 **APTIC NO. 70725**

Kawamura, Keita and Shinji Aoki

STUDY ON PROCESSING OF EXHAUST GASES BY ELECTRON BEAM IRRADIATION 2ND REPORT): PROCESSING OF EXHAUST GASES WITH FLOW-TYPE APPARATUS. *(Denshisen shosha nitoru haigasu shori ni kansuru kenkyu, dai 2-ho). Text in Japanese. Ebara Jiho (Ebara Times), no. 90:7-10, Dec. 1974. 6 refs.*

A new technique to continuously treat exhaust gases by electron beam irradiation is described. It is still in an experimental stage, but the simultaneous desulfurization and denitrification seem to be a great advantage. The heavy oil combustion gases are fed into an electrostatic precipitator before being introduced into the reaction chamber which is irradiated by an electron beam. The electron beam converts sulfur dioxide and nitrogen oxides to sulfuric acid mist and the solid compounds are filtered out by a second electrostatic precipitator at the outlet of the reaction chamber. The elemental composition of the solid compounds is sulfur, nitrogen, oxygen, and hydrogen. When a reaction temperature of 100 to 120 C was used, the desulfurization was 50 to 100% more efficient than when 245 C was used. Both desulfurization and denitrification efficiencies were 95 to 100% when an electron beam flux of 431,000 rad/sec was used and the flowing gas remained in the beam for more than 1 sec. The higher electron beam flux more effectively converted SO2 and NOx than the lower flux, even when the total absorbed amount of electron beam by the gases was the same. Large amounts of solid compounds were produced, and therefore reutilization of these products must be effected before the technique can be used at industrial levels.

50602 **APTIC NO. 70343**

Kertz, Walter

CAN GEOTHERMAL ENERGY COVER OUR ENERGY DEMAND? *(Kann Erdwaerme unseren Energiebedarf decken)? Text in German. Umschau Wiss. Tech., 74(21):661-666, 1974. 18 refs.*

Geothermal energy is one of the largest potential energy resources within man's reach. The use of such energy is presently limited to volcanic regions and areas with strong hydro-geological conditions. It may be possible in the future to extract energy from dry hot rocks. The geothermal situation of the Federal Republic of Germany is outlined. Unfortunately, geothermal plants are by no means free of pollution. Waste gases (primarily hydrogen sulfide) and a lot of waste heat are emitted. The environmental problems such plants create are enormous but not insoluble.

50603 **APTIC NO. 70313**

Kitagawa, Y., S. Ueno, S. Furukawa, Y. Sadakane, T. Soda, and C. Furutani

INVESTIGATION OF MALODORS FROM A RAYON FACTORY. *(Reyon kojo no akushu ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):465, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 316.)*

The effectiveness of odor control at a spinning factory in Iwakuni City, Japan, was investigated during seven days in 1974. Results of concentration analyses by gas chromatography, physical reactions to odor intensities, and questionnaires were compared and correlated. By treatment with the Takahax (THX) method and adsorption on active carbon, removal of high concentrations of hydrogen sulfide and carbon disulfide from exhaust gases was over 90%. However, gases emanating from the spinning machines were discharged directly into the air through odor exhaust chimneys. Concentrations of H2S as high as 67-85 ppm were found in the exhaust. Since total amount of exhaust gas discharged from the odor exhaust chimneys was 630,000 N cu m/h, adverse environmental impact was surmised.

50604 **APTIC NO. 70657**

Koberstein, E.

CLEANING OF AUTOMOBILE EXHAUSTS BY CATALYSTS. *(Autoabgasreinigung mit Hilfe von Katalysatoren). Text in German. Dechema-Monograph., 75(1452-1485):131-144, 1974.*

The state of the art of catalytic exhaust purification is surveyed. In the dual compartment process, the nitrogen oxides present in the exhaust gas are first reduced in a first catalytic chamber, after which hydrocarbons and carbon monoxide are oxidized to carbon dioxide and water in a second chamber under the admission of secondary air. The exhaust purification can also be achieved in single-compartment, three-way chambers with a bifunctional catalyst, or the catalytic exhaust control can be combined with engine modification, e.g., exhaust recirculation. The recent development of catalysts goes toward noble-metal catalysts applied on monolithic supports and partly toward loose contact material coated with noble metals. Noble-metal catalysts require the use of unleaded gasoline and of special motor oils.

50605 **APTIC NO. 70603**

Koshino, K., Y. Tanaka, N. Yoshino, M. Okamura, T. Nakano, and K. Miyoshi

THE EFFECTS OF EMISSION CONTROLLING DEVICES FOR VEHICLES. *(Tenka jiki seigyo sochi to shokubai sochi no heiyo ni yoru jissha tesuto kekka) Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):475, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 323.)*

The effect of an ignition timing control device and a catalytic converter used simultaneously for emission control was investigated by actual driving and engine dynamometer tests. Reduction rates of carbon monoxide, hydrocarbons, and nitrogen oxides emissions for 10,000 km driving (10-mode) were 68% for CO, 45% for HC, and 34% for NOx. Such reducing effects were maintained during the life of catalytic converter for CO and HC, and for the ignition timing control device for NOx. Safety was evaluated in terms of temperature rise at the catalytic converter bed, which showed a maximum temperature of 55 C and 64 C before and after the installation of ignition timing control device, respectively. The safety in terms of engine performance was unaffected by these emission control devices. As for the engine performances, a 3% increase in fuel consumption (10-mode driving) and a 9% decrease in acceleration were observed. Quantitative analysis of metallic catalyst in exhaust gas could not be obtained.

50606 **APTIC NO. 70544**

Krueger, Horst, Karl Heinrich Van Heek, and Harold Juentgen

WATER VAPOR GASIFICATION OF COAL WITH NUCLEAR REACTOR HEAT. *(Wasserdampfvergasung von Kohle mit Kernreaktorwaerme). Text in German. Gas Wasserfach, Gas/Erdgas (Munich) 115(12):538-542, 1974. 10 refs.*

Heat produced in the nuclear reactor is carried off in the form of hot circulating helium. By way of a heat exchanger the heat is transferred to a secondary cycle where the gaseous heat carrier (e.g., helium) passes first the gas generator, then the degasifier, and finally the steam generator. The coal is at first heated in the degasifier and pyrolized, at which process gas tar and low temperature coke develop. The latter goes to the gas generator and is gasified with water vapor. The gas generator yields a dusty gas which is first cleaned from dust and then from carbon dioxide and hydrogen sulfide. Through partial methanization the quality of the gas is then comparable to that of city gas with regard to gas composition, heating value, and Wobbe number. With a thermal capacity of the nuclear power plant of 3000 MW and a helium exit temperature of 950 C approximately 251 tons of coal can be gasified per hour yielding about 352,000 cu m city gas and about 47 tons of tar and oil. In addition, 571 MW of electric power are generated so that the energy conversion rate is 59%.

50607 **APTIC NO. 70656**

Kuipers, H.

LARGE DUST COLLECTION SYSTEMS IN METALLURGICAL PLANTS. *(Grossentstaubungsanlagen in Huettenwerken). Text in German. Tech. Mitt., 67(7/8):295-297, July/Aug. 1974. 3 refs.*

A brief review is given of the operating principle of wet (venturi scrubbers) and dry (cyclones, cloth filters) mechanical dust collectors and wet and dry electrostatic precipitators. Wet dust collectors are increasingly being used, primarily because of the low investment costs and the low space requirement. All dry mechanical dust collectors can be put together from small units to any desirable size. Pursuing the material flow in metallurgical plants, the first dust collector, a cyclone for collection of the coarse dust, is installed at the ore crushing and grinding station. At the sintering station, electrostatic precipitators are installed. The blast furnace is preceded by a cloth filter and succeeded by a wet electrostatic precipitator. For avoidance of brown smoke, electrostatic precipitators or venturi scrubbers succeed the converters. Cloth filters have been used increasingly for electric furnaces. Behind reverberatory kilns, wet electrostatic precipitators are used.

50608 **APTIC NO. 70276**

Kume, Teishi

INTERNAL COMBUSTION ENGINE. *(Nainen kikan). Text in Japanese. (Honda Giken Kogyo KK Tokyo (Japan)) Japan. Pat. Sho 49-41201. 3p., Nov. 7, 1974. 1 ref. (Appl. Nov. 16, 1970, 1 claim).*

An internal combustion engine is designed such that a concentrated gas mixture layer occurs near the spark plug, while a more dilute gas mixture layer is formed farther away. A combustion chamber with the spark plug is at the head of the cylinder. Air is injected into the cylinder from holes in the cylinder wall in a downward direction, away from the spark plug. After ignition, compression by piston motion forces the lower air layer into the gas mixture layer above it. Combustion occurs in layers from the more concentrated to the more dilute. Reliable ignition results, while total gas mixture remains extremely lean, and clean exhaust is formed. This invention is also applicable to rotary internal combustion engines.

50609 **APTIC NO. 70356**

Lovett, W. D. and F. T. Cunniff

AIR POLLUTION CONTROL TECHNIQUES: AIR POLLUTION CONTROL BY ACTIVATED CARBON. *Chem. Eng. Progr., 70(5):43-47, May 1974. 11 refs.*

Activated carbon is described in its use in controlling contaminants in a full range of concentrations from low ppm to 40% by volume. By concentrating emission streams, activated carbon can be used to produce fuels suitable for incineration. This should lead to increased air pollution control with reduced energy drain. Should air pollution codes become more stringent, activated carbon systems will not become obsolete. Simple changes in operational parameters will maintain or increase system efficiency. For example, if increased pollutant removal efficiency is needed, additional carbon capacity can be obtained by decreasing cycle times. This can be accomplished without the need for additional equipment.

50610 **APTIC NO. 73098**

Lowell, Philip S. and Klaus Schwitzgebel

POTENTIAL BYPRODUCTS FORMED FROM MINOR AND TRACE COMPONENTS IN COAL LIQUEFACTION PROCESSES. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 331-339, Oct. 1974. 20 refs.*

Potential by-products formed from minor and trace components in coal liquefaction processes are described. The fate of trace elements in coal liquefaction are determined by the interaction of coal constituents and process conditions. Minor components such as sulfur, nitrogen, and the trace element selenium are used as examples for identifying the problems associated with determining the fate of trace elements in liquefaction processes. Sulfur follows somewhat predictable rules. The sulfides have the greatest free energy and are most subject to attack. The free energy change of the thiophenes are all of the same order of magnitude. The aromatic S structures are fairly stable except under catalytic attack. Steric factors influence the rate and type of desulfurization. Nitrogen is more difficult to remove by hydrogenation than S. Selenium is of interest because of its toxicity and malodorous compounds. It is very similar to S and Se compounds analogous to S exist.

50611 **APTIC NO. 73095**

Magee, E. M. and H. Shaw

TECHNOLOGY NEEDS FOR POLLUTION ABATEMENT IN FOSSIL FUEL CONVERSION PROCESSES. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 309-313, Oct. 1974. 23 refs.*

Technology needs for pollution control in fossil fuel conversion processes are reviewed. The areas that are discussed include: dust, fumes, and water runoff from coal and shale storage; acid gas systems; dirty process water treatment; trace elements; and other needs such as raw gas scrubbing, lock hopper pressurization, noise, odors, and solid wastes. The overall problem with defining the pollution aspects of fossil fuel conversion is amplified by the fact that the quantities of pollutants are small when compared with the total plant effluent. Hazardous elements may be concentrated in some process area and may enter the environment in concentrations much larger than those in the original fossil fuel. Elements that may exist innocuously as oxides or carbonates in limestones used in scrubbing could be released as soluble ions when contacted with sulfur dioxide in flue gas scrubbing.

50612 **APTIC NO. 71227**

Mahoney, James R., Norman E. Gaut, and Elliot Newman

IMPACT OF FUEL AND LOAD SWITCHING ON AIR QUALITY. *AIChE Symp. Ser., 70(137):167-172, 1974. 8 refs.*

The use of fuel switching and load shifting in networks of electrical generating plants to conserve resources while meeting air quality goals is discussed. Feasible fuel switching and load shifting schemes are described, and approaches to the development of air quality indices are discussed. The elements required to implement a real-time control system are described, and operational experience with a real-time sulfur dioxide monitoring and forecasting system being used in central and northeastern U. S. is reviewed. This system, the Air Monitoring Analysis and Prediction (AIRMAP) system consists of SO2 monitoring at 183 sensor sites. Nitrogen dioxide is also measured. The sensors, telemetry, computer, and system accuracy are mentioned.

50613 **APTIC NO. 71050**

Marsheck, Robert M. and Forrest L. Poska

PURIFICATION PROCESS FOR A HYDROCARBON CONVERSION EFFLUENT. *(Phillips Petroleum Co., Bartlesville, Ohio) U. S. Pat. 3,819,741. 7p., June 25, 1974. 8 refs. (Appl. Sept. 8, 1971, 12 claims).*

A process for the oxidative dehydrogenation of hydrocarbons and the conversion of the oxygenated hydrocarbon byproducts formed during dehydrogenation to innocuous materials that can be discharged to the atmosphere in a nonpolluting manner is described. Aqueous streams containing oxygenated hydrocarbon impurities are contacted with particulate solids, either inert or catalytic, for the deposition of the oxygenated hydrocarbons onto the particulate material. The solids and deposited oxygenated hydrocarbons are then subjected to oxidation and combustion in a fluidized bed operation to convert the oxygenated hydrocarbons to carbon oxides and water which can be discharged to the atmosphere. (Author abstract modified)

50614 **APTIC NO. 70592**

Masuda, Nobuo

DAIDO CALORIC BURNER. LOW NOX BURNER. *(Daido karorikku bana. Tei NOx bana). Text in Japanese. Sangyo Kikai (Ind. Machinery), no. 286:12-14, July 1974.*

The caloric burner designed especially for the purpose of reducing nitrogen oxides formation is described. The air for combustion is injected through a link nozzle at a high flow rate. As a result of the jet effect, the pressure of the fuel injection port becomes lower than that in the combustion chamber and a part of the heated combustion gas is returned to the fuel injection port through the passage way around the link nozzle. The fuel injected into the high temperature (higher than 1500 C) circulating gas is completely vaporized, and therefore either a liquid or gas fuel can be used. Since the fuel is diluted with the circulating gas prior to the mixing with air and combustion, the formation of nitric oxide due to the local high temperature can be prevented. The combustion promoter such as aldehydes produced by the reaction of the fuel component and circulating gas component reduces the time required for complete combustion. The combustion can be complete with only a theoretical amount of air, and no carbon is produced even when the amount of air is less than the theoretical value. This burner can be applied to boilers and industrial furnaces as well as to small combustion equipment. The example of application to the water boiler is described with specifications.

50615 **APTIC NO. 70502**

Matsumura, Yuji

NOX ABATEMENT AND ENERGY SAVING MEASURES. *(NOx teigen to sho enerugi taisuku). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 26(11):10-21, Nov. 1974.*

A general discussion is given on combustion techniques for saving energy and nitrogen oxides prevention from the viewpoint of combustion management. Utilization of heat from waste solutions and waste gases in some particular cases such as drying can save up to 40% energy and reduce up to 60% of NOx. Waste gas at 800 deg emitted from a heating furnace at a flow rate of 8170 N cu m/hr can be used in a waste heat boiler to produce 2350 kg/hr steam plus 1500 kg/hr hot water. In industrial furnaces such as those for metal casting, the combustion technique is important in regard to energy saving and NOx reduction. Flat flame firing can increase the heating rate by 30% due to the increase in radiation effect of the furnace wall, in addition to the forced heat transfer by convection.

50616 **APTIC NO. 70220**

McArthur, Dennis P.

THE DEPOSITION AND DISTRIBUTION OF LEAD, PHOSPHORUS, CALCIUM, ZINC, AND SULFUR POISONS ON AUTOMOBILE EXHAUST NOX CATALYSTS. *Preprint, American Chemical Society, Washington, D. C., 31p., 1974. (Presented at the American Chemical Society, Symposium on Catalysts for Removal of Automobile Pollutants, Los Angeles, Cal., April 1-5, 1974.)*

Early results of studies directed towards the elucidation of the causes of catalyst degradation are presented. Specifically, the work is concerned with catalysts operated in systems using fully formulated motor oil, and fuel containing sulfur (approximately 350 ppm) and contaminant level lead (greater than or equal to 0.05 g/gal) and phosphorus (greater than or equal to 0.0005 g/gal). Electron microprobe line scans and X-ray images are presented to describe the variation of contaminant concentrations in both particulate and monolithic nitrogen oxide catalysts. Some results are presented to help characterize surface contamination. The axial and radial distributions of contaminants were determined for monolithic NOx catalysts subjected to extensive engine testing. The major contaminants were calcium lead, phosphorus, and zinc. With the exception of lead, contaminant concentrations varied insignificantly in the radial direction. For all contaminants, the concentration varied greatly in the axial direction, being greatest at the upstream end of the monolith. Contaminant retention is defined as the amount of a particular contaminant retained on the catalyst expressed as a fraction of the total amount of that contaminant generated by the consumption of oil and fuel during the test period. Using this definition, contaminant retention on monolithic catalysts was P greater than Pb greater than Zn greater than Ca. (Author abstract)

50617 **APTIC NO. 75223**

McDaniel, C. F.

WET SCRUBBER OPERATING EXPERIENCE AT LA CYGNE STATION UNIT NO. 1. KANSAS CITY POWER AND COMPANY, KANSAS GAS AND ELECTRIC COMPANY. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization, Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-a, p. 319-327, Dec. 1974. (Nov. 4-7.)*

NTIS: PB 242572/AS

Operating experience with a limestone flue gas desulfurization system serving a coal-fired 820 MW electrical generating unit is reviewed. Maximum sulfur dioxide removal efficiencies range between 75 and 83%. System scrubber chemistry is very difficult to control within limits that do not produce scale. Pluggage and erosion of the venturi spray nozzles occurs when large quantities of calcium sulfate scale are generated during operation outside the normal chemistry limits. Another problem is the buildup of wet fly ash deposits on the rotors of induced draft fans, necessitating frequent fan washing and balancing. Operating costs for 9 mo of operation amount to 1.40 mils/KW. The total capital cost of the scrubber is $51/KW.

50618 **APTIC NO. 75219**

McGlamery, G. G. and R. L. Torstrick

COST COMPARISONS OF FLUE GAS DESULFURIZATION SYSTEMS. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization, Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-a, p. 149-223, Dec. 1974. (Nov. 4-7.)*

NTIS: PB 242572/AS

A cost appraisal of the five most advanced flue gas desulfurization processes is presented. The base case system for which the cost estimates are presented includes a new 500 MW unit burning coal with 3.5% sulfur, a 30-year life (127,500 hr of operation), 90% sulfur dioxide removal, and fly ash removal. The capital and average annual operating costs, respectively, for limestone processes are $25,163,000 and $7,702,700 as compared with $22,422,000 and $8,101,900 for lime slurry processes, $26,406,000 and $9,210,800 for magnesia slurry processes, $30,491,000 and $11,601,500 for sodium processes, and $42,736,000 and $8,873,900 for catalytic oxidation processes. In addition, double alkali processes are estimated to be at least 20-25% more costly than lime or limestone scrubbing.

50619 **APTIC NO. 71049**

McKee, Joseph W.

METHOD AND APPARATUS FOR REDUCING EMISSION OF POLLUTANTS IN EXHAUST GAS FROM INTERNAL COMBUSTION ENGINE. *(Assignee not given.) U. S. Pat. 3,813,878. 5p., June 4, 1974. 9 refs. (Appl. March 22, 1972, 3 claims).*

A relatively economical afterburning system for the reduction of unburned exhaust emissions from internal combustion engines is described. The system consists of an engine-driven air pump which delivers air under pressure to an exhaust manifold and an afterburner disposed downstream from the muffler. The afterburner is energized by a vibrating type high voltage coil which provides continuous sparking across the spark plug gaps. The afterburner is constructed to prevent back pressure in the exhaust system, and the spark plugs are disposed at points of high turbulence in the exhaust gas to promote continuous ignition of combustibles with added air. (Author abstract modified)

50620 **APTIC NO. 75250**

Meliere, K. A., R. J. Gartside, W. A. McRae, and T. F. Seamans

DESCRIPTION AND OPERATION OF THE STONE AND WEBSTER/IONICS SO2 REMOVAL AND RECOVERY PILOT PLANT AT THE WISCONSIN ELECTRIC POWER COMPANY, VALLEY STATION, IN MILWAUKEE. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue GasDesulfurization Proc. Symp., Atlanta, Ga.,1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 1109-1126, Dec. 1974. (Nov. 4-7.)*

Pilot plant studies of the Stone and Webster/Ionics sulfur dioxide removal process are described. The process involves the absorption of stack gas SO2 in aqueous caustic which is subsequently regenerated in electrolytic cells. The SO2 can be recoveredin commercially pure forms or converted to commercial sulfuric acid or elemental sulfur. Sulfur dioxide removal of 85-95% at exit concentrations of 200-300 ppm SO2 was obtained with the process ina 2000 ACFM pilot plant. Oxidation of SO2 in the absorber varied from 7-25% (maximum error of measurement 7%). The total estimated operating cost for a system serving a 500 MW coal-fired boiler (3.5% sulfur) is about $4,000,000 for 90% SO2 removal. (Author abstract modified)

50621 **APTIC NO. 70333**

Mori, Kenji, Kei Utsunomiya, Kazuya Soga, Katsunori Shimasaki, Yutaka Mito, and Mamoru Aoki

REDUCTION OF NO BY NH3 ON METAL OXIDES. *(Kinzoku sankabutsujo ni okeru NO no NO3 ni yoru kangen). Text in Japanese. Preprint, Japan Chemical Society, Sendai, p. 655, 1974. (Presented at the Japan Chemical Society, Fall Meeting, 31st, Sendai, Japan, Oct. 2-5, 1974, Paper 2Q17.)*

Reduction of nitric oxide by ammonia on various metal oxide catalysts was investigated. Decomposition of NH3 during the process was also studied. At 400 C, 80-100% NO removal occurred for oxide catalysts of copper (100%), chromium (80%), and vanadium (80%). However, use of Cu and V resulted in large amounts of NH3 decomposition, unless the catalysts were reduced with hydrogen prior to use. There was very little NH3 decomposition with Cr catalysts, whether treated or untreated with H2.

50622 **APTIC NO. 70336**

Morikawa, Shigeru, Takashi Watanabe, Kazumasa Takahashi, and Satoru Kurita

STUDIES ON OZONE OXIDATION-ABSORPTION REDUCTION OF NOX (REPORT NO. 1). *(NOx no ozon sanka-kyushu kangenho ni kansuru kenkyu (Dai-ichiho)). Text in Japanese. Preprint, Japan Chemical Society, Sendai, p. 651, 1974. (Presented at the Japan Chemical Society Fall Meeting, 31st, Sendai, Japan, Oct. 2-5, 1974, Paper 2Q13.)*

Studies were conducted on ozone oxidation-sodium sulfite absorption reduction and ozone oxidation-urea absorption reduction for nitrogen oxide removal. Oxidation was conducted with ozone-air on nitric oxide-nitrogen gas (concentrations measured as residual N2). Reduction-absorption removal was then effected with aqueous solutions of either 10 wt% Na2SO3 or 10 wt% (NH2)2CO. For an NO-N2 concentration of 683 ppm, SV of 2200/hr (20 C), 100% NO oxidation and 100% NOx removal were observed. In the temperature range of 20 to 220 C, the rate of ozone oxidation decreased as temperature increased. It was observed that for O3/NO necessary for 100% oxidation of NO, the lower the NO concentration, the lower the oxidation rate and the more difficult it is to effect oxidation.

50623 **APTIC NO. 70351**

Morita, Minoru, Tatsuyuki Kawanishi, Misao Igarashi, and Yoshitada Kurata

SODIUM SULFATE MANUFACTURING METHOD FROM EXHAUST GAS. *(Haigasu yori ryusan natoriumu no seizohoho). Text in Japanese. (Tsukishima Machinery Co., Tokyo (Japan)) Japan. Pat. Sho 49- 40358. 4p., Nov. 1, 1974. 2 refs. (Appl. Oct. 23, 1970, 1 claim).*

A commercially feasible method for manufacturing sodium sulfate from sulfur dioxide gas is described. An economically important feature of this method is that external heat is unnecessary for evaporation of water accompanying sodium hydroxide, since exhaust gases in contact with the circulating liquid have a temperature above 110 C. The water is evaporated and carried along with the exhaust gases out of the system. Sulfur dioxide in the exhaust gases is reacted with sodium hydroxide to form sodium sulfite, which is oxidized and separated as sodium sulfate crystals. The pH of the sodium sulfite solution must be in the range of 4.0-7.0, and oxidization occurs in pH range of 3.0-7.0. Neutralization of the resultant liquid from oxidation is conducted in two steps. In the first step, heavy metals are precipitated and separated in the pH range of 7-10. In the second step, sodium sulfate crystals are precipitated from sodium hydroxide concentrations of 2-10%. The mother liquor is then recycled to react with sulfur dioxide in the exhaust gases.

50624 **APTIC NO. 75222**

Mundth, Lyman K.

OPERATIONAL STATUS AND PERFORMANCE OF THE ARIZONA PUBLIC SERVICE COMPANY FLUE GAS DESULFURIZATION SYSTEM AT THE CHOLLA STATION. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization, Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-a, p. 307-313, Dec. 1974. (Nov. 4-7.)*

NTIS: PB 242572/AS

The design and operation of a limestone flue gas desulfurization system serving a coal-fired 115 MW electrical generating unit are discussed. About 70-85% of the sulfur dioxide in the flue gas passes through a flooded disc scrubber into a cyclone mist eliminator where the captured ash and entrained slurry are removed. The flue gas then passes into a packed tower which contains 2-5 ft of Munters packing, a wetted film packing. A limestone slurry is recirculated through the absorber packing and absorbs SO2, with the flue gas and slurry being contacted countercurrently. A high liquid to gas ratio and a moderate concentration of reaction products are maintained to minimize scaling. Total SO2 removal in the train containing packing is expected to be around 80%. Major problems encountered thus far include: corrosion in the reheater and breeching expansion joints, mechanical problems in the flooded disc control system, by-pass damper, and reheater, scaling in the scrubber vessel, mist eliminator, and piping, and plugging in the nozzles to the flooded disc and mist eliminator. The total cost for operating the scrubber is an estimated 0.6 mills/KW-hr.

50625 **APTIC NO. 70627**

Murakami, Motomata

REMOVAL METHOD AND APPARATUS FOR UNBURNED GASES AND SMOKE IN INCINERATOR. *(Shokyakuro ni okeru baien oyobi fukanzen nensho gasu no jokyo hoho narabini sono sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-49072. 5p., Dec. 25, 1974. (Appl. April 6, 1971, 2 claims).*

The removal method and device for incompletely combusted gases from an incinerator used for disposal of plastic scraps are described. The incinerator system consists of primary and secondary combustion chambers, a vaporization chamber, a horizontal flue with several spray washing chambers placed in a series, and corresponding water tanks for collecting sprayed water. The water is supplied to the last spray chamber, collected in the bottom tank, and then supplied to the adjacent spray chamber, repeated the same process until it reaches the vaporization chamber. The spray water is heated while passing through the spray chambers and finally vaporized in the vaporization chamber. The vapor produced is led through the flue and spray chambers with exhaust gas capturing smoke and toxic gases, which is condensed in spray chambers and returned to water tanks, thus circulating in the system while cleaning the exhaust gas.

50626 **APTIC NO. 70630**

Murthy, N. S. and S. B. Gupta

DETERMINATION OF ENGINE OPERATING VARIABLES FOR MINIMUM EMISSION OF POLLUTANTS. *J. Inst. Engrs. (India) (Calcutta), vol. 55, part ME 1:5-11, Sept. 1974. 22 refs. (Presented at the Paper Meeting, Semi-Annual, Bangalore, July 20-21, 1974.)*

The effects of engine operating variables on exhaust emissions were investigated in a single cylinder variable compression ratio engine. Cooled exhaust hydrocarbons from an engine can be minimized by operating the engine on lean air-fuel ratios (above 15:1), increasing manifold pressure, decreasing compression ratio, and advancing the spark timing. By operating the engine on rich air-fuel ratio or by lowering the peak temperature attained during the combustion cycle and by decreasing inlet manifold pressure, the nitrogen oxides are reduced. Low carbon monoxide emissions are obtained by lean operation of the engine. (Author conclusions modified)

50627 **APTIC NO. 70518**

Nagata, Katsuya

THE RECENT TREND IN THE NOX COUNTERMEASURES FOR COMBUSTION EQUIPMENT. (MAINLY ON LOW NOX BURNERS). *(Nensho sochi ni okeru NOx taisaku gijutsu no saikin no doko. (Shutoshite tei NOx bahna ni tsuite)). Text in Japanese. Preprint, Japan Fuel Assoc., p. 14-31, 1974. 14 refs. (Presented at the Japan Fuel Association Lecture Meeting on Combustion Devices, Tokyo, Japan, Nov. 14-15, 1974.)*

The nitrogen oxides emission from fixed sources can be controlled by two means, improvement in combustion technique and denitration of exhaust gas. The formation of NOx varies greatly with general combustion characteristics, and a variety of control measures can be taken. The formation mechanism of NOx is reviewed. The characteristics of various control measures by altering operational conditions such as the air ratio, mixing characteristics in the combustor, thermal load and air preheating, alteration in the combustion method, use of low NOx burner, exhaust gas recirculation, two-stage combustion, and off-stoichiometric combustion, are discussed. The control measures by fuel conversion and combinations of various control measures are also discussed. The status of the development of NOx control measures is reviewed. Four types of low NOx burners are described with the principle, structure, and characteristics.

50628 **APTIC NO. 70634**

Nakago, K and S. Haseba

GAS ABSORPTION TECHNIQUE BY HALF-DRY METHOD. *(Hankan-shiki gasu kyushu hoho). Text in Japanese. (Kobe Seiko Co., Ltd., Kobe (Japan)) Japan. Pat. Sho 49-43187. 5p., Nov. 19, 1974. 1 ref. (Appl. Oct. 6, 1970, 1 claim).*

The removal or recovery of nitrogen oxides and sulfur oxides by chemisorption using sodium chlorite or sodium hypochlorite solutions is described. The sorption tower consists of a packed layer of porous carrier such as alumina, silica gel or zeolite, gas inlet and outlet valves, inlet and outlet valves connected to the reaction solution tank, an inlet valve from the regeneration solution tank, and an outlet valve to a separatory device where reaction products, unreacted reaction solution, and regeneration solution are separated and returned to corresponding tanks. The carrier is immersed in a reaction solution, and excessive reaction solution is drained back to the tank. Then the gas valves are opened for chemisorption removal of NOx and SOx. Finally the reaction product on the carrier is removed with the regeneration solution. More than two towers are placed in a series for more complete removal of the designated gases.

50629 **APTIC NO. 70492**

Nakamoto, Mitsuyuki, Yoshioki Shingo, Mamoru Takeuchi, and Masaru Ogawa

METHODS FOR PRODUCING REDUCTION CATALYSTS FOR TREATING NITROGEN OXIDES AND/OR LEAD COMPOUNDS IN EXHAUST GASES FROM INTERNAL COMBUSTION ENGINES. *(Nainenki haiki gasuchu no chisso sankabutsu oyobi (matawa) enkagobutsu no kangen shokubai o seizo suru hoho). Text in Japanese. (Fujikura Electric Wire Co., Tokyo (Japan)) Japan. Pat. Sho 49-25116. 3p., June 27, 1974. (Appl. Dec. 30, 1970, 1 claim).*

The manufacture of a superior catalyst for removal of nitrogen oxides and/or lead from the exhaust gases of internal combustion engines is detailed. A layer of air-laid-web is made of heat-resistant alloy fiber which uses iron as the base and which contains nickel and chromium. Upon this felted fiber alloy layer are deposited copper oxide, copper or nickel halogen compounds, and a mixture containing black lead as both falkes and fine powder. Another layer of air-laid-web is deposited on this, and the sandwich is heated to a temperature near 750 C in a nonoxidizing atmosphere. After fusion, the sandwich is cooled to room temperature in the nonoxidizing atmosphere and used as catalyst.

50630 **APTIC NO. 70596**

Nakano, K., M. Kyoda, and T. Goto

CONTROL OF TETRACHLOROETHYLENE FROM DRY CLEANING PROCESSES. *(Dorai kuriningu shisetsu ni okeru tetora kuroru echiren Tokyo sochi no koritsu sokutei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):442, Nov. 1974. (Presented at 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 293.)*

A closed-type dry cleaning machine uses tetrachloroethylene as the washing agent. Tetrachloroethylene in the waste drying gas was adsorbed on activated charcoal and recovered by passing steam through the adsorbent. Analyses were done at more than 12 dry cleaners to determine the tetrachloroethylene removal efficiency. Gas was sampled from the stack by using a syringe and analyzed by gas chromatography with a flame ionization detector. Tetrachloroethylene in the resulting gas before treatment was as high as 14,000 ppm and the removal efficiency ranged from 92.7% to 99.9%.

50631 **APTIC NO. 69005**

Nakano, Teruji

REFUSE INCINERATOR. *(Jingai shokyakuro). Text in Japanese. (Myojo Metal Works (Japan)) Japan. Pat. Sho 49-25031. 2p., July 27, 1974. (Appl. Dec. 31, 1970, 1 claim).*

An invention for the complete combustion and prevention of dust scattering from refuse incinerators is described. The device has the following characteristics: an upper stack plate and a lower stack plate on top of an incinerator; a vortex type separating plate perpendicularly arranged in between the two plates; a stack combustion chamber and a heat releasing cylinder extending into an incinerator from the bottom of the combustion chamber; a spiral gas burner which can provide flame evenly in the combustion chamber; and a heat insulator underneath the upper stack plate. Combustion gases from the incinerator enter the stack combustion chamber through the heat releasing cylinder, where they are further burned. The resulting gas leaves the combustion chamber to the stack through the vortex separating plate.

50632 **APTIC NO. 70329**

Nakata, Masahiko and Nobuyuki Kobayashi

EXHAUST GAS COUNTERMEASURES AND CAR OPERATION. REPORT NO. 2: NOX CONTROL AND DRIVABILITY. *Text in Japanese. Preprint, Society of Automotive Engineers of Japan, p. 397-408, 1974. 1 ref. (Presented at the Society of Automotive Engineers of Japan Meeting, Oct. 15-17, 1974.)*

The relationship between the variation in forward and backward acceleration and the sensory evaluation of surging was quantified. The passenger experienced discomfort when the degree of vehicle surging exceeded 0.005 G. During quantitative evaluation of acceleration variation, the delaying of ignition time for the purpose of reducing hydrocarbon emissions during the warm up period at cruising was disadvantageous from the standpoint of surging. The quantitative evaluation of torque variation in the propeller shaft of bench engines was made possible by the use of a surge-meter. Since the relationship between the degree of engine surging and degree of vehicle surging was quantified, the degree of vehicle surging could be estimated by measuring torque variation of bench engine. The nitrogen oxides control by means of the exhaust gas recirculation (EGR) and ignition time delay evaluated from the standpoint of surging indicated that the EGR method was more advantageous in the case of a substantial decrease in NOx level. The evaluation of modifications in combustion chambers indicated that the decrease in NOx by reducing the combustion rate was disadvantageous from the standpoint of surging.

50633 **APTIC NO. 70542**

Nakata, Masahiko, Masato Yokota, and Nobuyuki Kobayashi

EXHAUST GAS COUNTERMEASURES AND CAR OPERATION. REPORT NO. 1: METHOD FOR AN OBJECTIVE EVALUATION OF DRIVEABILITY. *(Haiki gasu taisaku tu untensei, dai-1-po: untensei no kyakkanteki hyoka hoho). Text in Japanese. Preprint, Society of Automotive Engineers of Japan, p. 385-396, 1974. 6 refs. (Presented at the Society of Automotive Engineers of Japan Meeting, Oct. 15-17, 1974.)*

For the measurement of vehicle surging, an accelerometer pick-up was installed by the rear seat and a torque-meter was installed on the propeller shaft. The cycle change of the engine is a primary cause for surging, however, it is not directly related to surging. The engine surging (bench test) was also measured and the torque variation (engine surging) on the propeller shaft showed a good correlation to the forward and backward acceleration variation of the vehicle (vehicle surging). Therefore, the estimation of surging of vehicles can be made based on the engine surging. The vibrational frequency of the engine system is generally in the low frequency range of less than 20 Hz, which corresponds to the frequency range of forward and backward vibration most sensitively felt by humans. The formation mechanism of vehicle and engine surging originating in the cycle change of the engine is described. For the evaluation of vehicle surging, the evaluation by the average amplitude of forward and backward acceleration variation seems to be most appropriate. The surge-meter for quantitative evaluation of average amplitude of acceleration variation or torque variation was developed.

50634 **APTIC NO. 70658**

Nakaya, T., K. Yoshimura, and M. Takahashi

TREATMENT OF DUST FROM METAL MELTING FURNACE (NONFERROUS METAL). *(Kinzoku yokairo (hitetsu kinzoku) no baijin shori ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):429, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 280.)*

Results of an investigation on 217 facilities for metal processing in Osaka Prefecture (excluding Osaka city) are given. The facilities included 50 reverberatory furnaces, 148 crucible furnaces, and 19 low-frequency induction furnaces. Furnaces used to regenerate Al emitted Al metal fumes, chlorine, and fluorine, whereas those used for alloy manufacturing emitted metal fumes and sulfur dioxide. For the removal of metal fumes, bag filters were employed, and for the removal of metal fume accompanied with gaseous substances, a bag filter together with a scrubber was used. Results of measurement at a manufacturing plant showed that the combination of a bag filter and a scrubber reduced particulates from 0.11 g/N cu m to 0.04 g/N cu m, Cl_2 from 1896 ppm to 15 ppm, and HCl from 2000 ppm to 50 ppm.

50635 **APTIC NO. 70581**

Namai, Kisaburo

FAN FOR STACK-GAS DESULFURIZATION FACILITY. *(Haien datsuryuyo sofuki). Text in Japanese. Ebara Jiho (Ebara Times), no. 90:11-16, Dec. 1974. 3 refs.*

Dry and wet desulfurization techniques are widely used in sulfur dioxide emission control. General specifications of different types of fans used in sulfur dioxide absorption equipment are given. The requirements are quite different for fans installed on the inlet at the outlet side of the absorpton process. On the outlet side, care must be taken to avoid corrosion of the fan material. Stainless steel or steel containing a high nickel content should be used. On the inlet side, where the gas temperature is high, this effect is the most important consideration. Expansion of the fan material is another factor since the temperature in the inlet side varies with factory operation. Friction of fan parts must be considered regardless the fan location in the absorption process. The fan must be dependable, durable, and easily repaired. The first two requirements can be improved by careful selection of fan materials, and the last solved by better fan design. Noise pollution associated with fan operation should be avoided.

50636 **APTIC NO. 73089**

O Hara, J. B., S. N. Rippee, B. I. Loran, and W. J. Mindheim

ENVIRONMENTAL FACTORS IN COAL LIQUEFACTION PLANT DESIGN. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 169-180, Oct. 1974. 1 ref.*

Expected effluent streams from a proposed coal liquefaction plant (10,000 tons/day of coal) are analyzed with respect to their sources and relative proportions. Principal gas streams leaving the complex are from the oxygen plant carbon dioxide removal unit, the sulfur recovery unit, fired heaters in the liquefaction and steam generation sections, and gas turbines utilized for power generation. Combustion gases amount to about 90% by volume of the total plant gas emission. The waste gases include sulfur dioxide, nitrogen oxides, hydrogen sulfide, and carbon dioxide. Firing with the low-Btu gas produced in the plant is expected to result in 4-15 ppm SO2 and 50-100 ppm NOx. Hydrogen sulfide content of the sulfur recovery plant stream is expected to be less than 5 ppm. All gaseous and particulate wastes are anticipated to conform with ambient air quality standards.

50637 **APTIC NO. 70355**

Okada, Hiroshi and Seiichiro Kumagai

EFFECTS OF BARIUM COMPOUNDS ON FORMATION OF SOOT--FIRST REPORT, IN CASE OF COMBUSTION OF A SINGLE FUEL DROP. *(Bai shosei ni oyobosu baryumu kagobutsu no eikyo. Dai-ichi-ho. Tanichi nenryo ekiteki no nensho ni oite). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Osaka, p. 207-210, 1974. 3 refs. (Presented at the Japan Society of Mechanical Engineers, National Meeting, 52nd, Osaka, Japan, Nov. 3-5, 1974, Paper 1523.)*

When barium compounds were used as additives in diesel engine fuel, the concentration of black smoke exhaust decreased. However, there was no visible effect on the exhaust when an additive composed primarily of barium carbonate was used in single fuel drop ignition tests. When the fuel drop was burned in an atmosphere containing pulverized barium oxide, soot formation was suppressed. The typical barium flame color was observed at the outer surface of the flame.

50638 **APTIC NO. 70660**

Okamura, Hiroshi

INDUSTRIAL FILTER MATERIAL. *(Kogyo firuta-zai). Text in Japanese. (Yamazaki Chemical Research Lab. Co., Ltd., Saitama (Japan) and Fujiboseki Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-43630. 4p., Nov. 22, 1974. 1 ref. (Appl. Feb. 21, 1970, 1 claim).*

From natural leather, the industrial filter material of chrome-collagen fibers containing 2-4% of chromium (calculated as chrome oxide) are prepared. Using steerhide, collagen fibers are obtained by the following procedure: immersion and washing with water, graining, immersion in lime solution, reimmersion in lime solution, enzyme treatment, pickle treatment, chrome treatment, and neutralization. The adsorption measurement of sulfur trioxide by varying Cr content indicated the decrease in adsorption at Cr content higher than 3%. On the other hand, the temperature at which shrinkage occurs becomes higher with thy increase in Cr content. The adsorption of SO3 on various fibers was 9.26 for chrome-collagen, 12.17 for wool, 8.86 for silk, 0.57 for acetate, 0.64 for nylon, and 0.77 for rayon, indicating higher adsorbability of natural fibers compared to synthetic fibers. The amount of SO3 adsorbed increased with the increase in moisture content of chrome-collagen fibers.

50639 **APTIC NO. 70701**

Onishi, Shigeru, Saburo Yui, and Katsuji Shoda

TWO CYCLE STRATIFIED GAS ENGINE. *(Nisaikuru-shiki sojo kyuki kikan). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-43738. 8p., Nov. 22, 1974. (Appl. Oct. 26, 1970, 3 claims).*

Uniform combustion by eliminating misfiring during the idling, improvement in the fuel consumption ratio, and reductions in air pollutant emissions were accomplished by the use of a separate charging port for idling and stratified charging. In the two-cycle engine with a piston, the exhaust and charging port were controlled by piston movement and spark ignition located at the cylinder head, the charging port was closed during the idling by means of flow control valve. The chaging port for idling which opens at bottom dead point was located at the opposite side of exhaust port. During idling, the mixed gas charged from the idling charging port was stratified near the top dead point of piston. The mixed gas flow from the idling charging port was controlled by the flow regulator. Multiple numbers of idling charging ports may be placed at corresponding positions, forming the mass of mixed gas which is stratified in the cylinder head near the top dead point.

50640 **APTIC NO. 70375**

Osuga, Mutsuo

VARIOUS PROBLEMS ON COMBUSTION AND COMBUSTION EQUIPMENT PRESENTED BY FUEL CONVERSION. *(Nensho sochi ni okeru nenryo tenkan ni tomonau nensho no shomondai). Text in Japanese. Preprint, Japan Fuel Assoc., p. 1-13, 1974. (Presented at the Japan Fuel Association Lecture Meeting on Combustion Devices, Tokyo, Japan, Nov. 14-15, 1974.)*

The ultimate means for controlling sulfur oxides pollution is the use of high quality fuels such as liquefied natural gas (LNG) and naphtha. At the Tokyo Thermal Power Plant, some of the boilers are already using or are being converted from heavy oil to LNG or naphtha fuel. To accommodate long-term steady fuel supply, the boiler has to be equipped for efficient combustion of various types of fuels. The fuel characteristics of LNG and naphtha, combustion characteristics in the boiler (relationship between carbon/hydrogen and combustion, burner type, exhaust gas characteristics), and design alterations of the boiler necessary for fuel conversion (burner, fuel storage tank, ventilation, and saftey measures) are described. The operation record of boilers in operation since 1970 and problems encountered are discussed.

50641 **APTIC NO. 70615**

Ozasa, Minoru, Takeshi Takano, Takuro Kotera, Keiichi Watanabe, and Masahiro Tsujikawa

A REMOVAL PLANT OF NITROGEN OXIDE USING AN ALKALINE ABSORPTION METHOD. *(Arukari kyushuho niyoru chisso sankabutsu jokkyo sochi). Text in Japanese. Nat. Tech. Rep. (Matsushita Electr. Ind. Co., Osaka), 20(5):580-591, Oct. 1974. 16 refs.*

A method of removing nitrogen oxides from stack gases using alkaline absorption is discussed. During reactions in which high NOx concentrations are emitted and nitrogen dioxide compostion is rich, such as polishing and dissolution of metals with nitric acid, NOx removal by alkaline solution absorption is the most suitable method. A removal system using the absorption method was designed on an industrial scale; the material and energy balance in absorption and the relationships between gas belocity and diameter and height and pressure drop of the absorption tower were the determining factors. The relationships between removal efficiency, amount of initial investment, and cost of operation were calculated. Equations for the chemical reaction were determined by analyzing the composition of the inlet gases and the solution after absorption. In absorptions using an alkaline solution, the best efficiency was obtained at a ratio of 0.55 of NO2/NOx. The reason for the rapid and easy removal of NOx when nitric oxide and NO2 exist together was clarified. Packing materials having the character of catalyst and adsorbent were suitable in the absorption tower. In the case of crushed activated carbon, good results were obtained at a space velocity of 5000/hr and superficial velocity of 0.5 m/sec in the tower. The temperature of the alkaline solution affected the removal efficiency -- the efficiency increased with decreasing solution temperature. Three examples of application of this control method are discussed in which the results were always lower than 200 ppm when the inlet concentration was about 5000 ppm. These applications are dissolution of metals, heat decomposition of nitrate, and nitric acid production. In the case of NOx exhausted from boilers and glass melting furnaces in which the composition of NO/NOx is about 90%, another strong catalytic oxidation process will be needed before the alkaline absorption process.

50642 **APTIC NO. 75224**

Pernick, Steve L., Jr. and R. Gordon Knight

DUQUESNE LIGHT COMPANY PHILLIPS POWER STATION LIME SCRUBBING FACILITY. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization, Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-a, p. 329-356, Dec. 1974. (Nov. 4-7.)*

NTIS: PB 242572/AS

Experience with the design, start-up, and operation of a lime scrubbing system serving a coal-fired 387 MW electrical generating unit is described. Sulfur dioxide removal efficiencies ranged from 86-93% for inlet concentrations ranging from 1263-1603 ppm by volume at stoichiometric ratios from 1.01-1.15. Corrosion problems initially experienced and apparently due to operation at too low a pH and too high a chloride concentration were minimized by operation of the dual stage SO2 scrubber with full lime addition, the addition of supplemental lime feed to other scrubbers for dust removal, and the installation of a redesigned spray system. The total capital and operating costs, exclusive of sludge disposal facilities, are estimated at $91/KW and 5.5 mils/KW-hr, respectively.

50643 **APTIC NO. 70507**

Peters, Werner and Hans-Dieter Schilling

NEW CHANCES FOR COAL GASIFICATION. *(Neue Chancen fuer die Kohlenvergasung). Text in German. Glueckauf (Essen), 110(22):927-935, 1974. 21 refs.*

In view of the energy crisis coal gasification receives new importance, particularly in the Federal Republic of Germany, where coal reserves are large. The chemical and physical fundamentals of the gasification process are well known, and quite a variety of different gasification processes are available. The basic gasification reactions are reviewed and the Lurgi pressure gasification process, the Bamag-Winkler gasification process, and the Koppers-Totzek process are briefly described. Some advantage is obtained from the use of nuclear process heat. The methane output per ton of coal with a concentration of volatile components of 35% by weight rises from only 550 cu m methane to 880 cu m methane through the use of nuclear heat. Of further advantage is that the developing carbon dioxide quantity is reduced from 1030 to 700 cu m per ton of coal, a 30% reduction. Power plants with preceding pressure gasification of coal require less voluminous and expensive gas cleaning facilities because a smaller volume of gas must be cleaned and cleaning takes place under pressure.

50644 **APTIC NO. 73094**

Princiotta, Frank T.

STATUS OF FLUE GAS DESULFURIZATION TECHNOLOGY. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 277-306, Oct. 1974. 4 refs.*

The status of flue gas desulfurization (FGD) technology is reviewed. Information is included which lists operating and planned commercial FGD systems in the United States and Japan, sulfur dioxide removal efficiencies achievable, typical capital and operating costs, other environmental considerations, retrofit considerations, and barriers regarding rate of FGD system installation. Lime/limestone, double alkali, magnesium oxide, Wellman Lord, and Catalytic Oxidation FGD systems are described including advantages, disadvantages, and operational status. Summaries of operational status of operating United States and selected Japanese FGD full-scale systems are included. (Author abstract modified)

50645 **APTIC NO. 70537**

Radke, D.

DRY CLEANING PROCESSES FOR WASTE GASES FOR SEPARATION OF DUSTS AND HYDROGEN FLUORIDE. *(Trockenreinigungsverfahren fuer Abgase zur Abscheidung von Staeuben). Text in German. Tech. Mitt., 67(11):484-489, 1974. 6 refs. (Presented at the Seminar on Dust Collection in Industrial and Commercial Plants, Haus der Technik, Essen, West Germany, May 15, 1974.)*

A dry method for the separation of hydrogen fluoride is described. Quicklime is agitated as separating agent in funnel-shaped reactors, reducing the hydrogen fluoride concentration to less than 1 mg/cu m waste gas. With the same method, hydrogen chloride could be separated on laboratory scale if quicklime dust was added to an oxygen lancing plant. The equipment comprises a radial ventilator, two reactors, one cyclone, one bag filter, and accessories such armatures, pipes lime storage and a feeder. The waste gas is pressed by the ventilator through two successive reactors where reaction of the fluorine with the agitated quicklime takes place and calcium fluoride is formed. The solid matter carried off with the waste gas from the second reactor is separated first in a cyclone and then in a cloth filter.

50646 **APTIC NO. 70792**

Ramakrishnan, P. A., B. L. Bihani, and P. S. Hangal

KRAFT RECOVERY BOILERS. PART II: BASIC OPERATIONAL AND DESIGN FEATURES. *Indian Pulp Pap., 28, 29(12, 1):13-15, 17-21, June- July 1974. 9 refs.*

Basic operational and design features of kraft recovery boilers are reviewed along with heat recovery and pollution control considerations. The basic concept of a recovery unit as applied to kraft pulping is to recover fresh cooking liquor with minimum losses during the chemical recovery cycle. This concept includes heat recovery and odor recovery. Multiple effect evaporators offer better steam recovery and less odor problems in comparison to direct contact evaporators, though the latter are simpler and less expensive. Flue gases containing various sulfur compounds and particulates (sulfates) can be treated with either a venturi scrubber or an electrostatic precipitator. Higher thermal efficiency and lower investment cost are advantages associated with scrubbers, though their collection efficiency is low compared with electrostatic pricipitators. Warm-type precipitators are generally situated after the economizer and receive gases at temperatures of 120-150 C. Hot-type precipitators are situated after the economizer and work with flue gases at temperatures of 375-400 C.

50647 **APTIC NO. 70567**

Rasch, R.

DEGASIFYING AND GASIFICATION OF REFUSE. *(Muellentgasung und -vergasung). Text in Geman. Aufbereitungs-Technik, 15(12):691- 696, Dec. 1974. 20 refs.*

Degasifying and gasification have recently received increasing attention as thermal processes for waste disposal, although many of these processes are still in a developmental state. It is advisable to dissociate the condensing components of the pyrolytic products on red-hot coke and to convert them to low moleuclar hydrocarbons. Presently the Destrugas process with parallel flow pyrolysis of trash seems to be the most advanced and promising method. The trash is comminuted to pieces not bigger than a nutshell. The gas obtained in the vertical degasification chamber contains a higher fraction of hydrogen chloride from the conversion of polyvinyl chloride than from hard coal gas. It is cleaned by the methods applied to other gases. Hydrogen chloride is washed with ammonia; the other components to be removed from the gas are hydrogen sulfide and hydrogen cyanide. The Destrugas process seems to provide a real alternative to disposal into a sanitary landfill or composting in regions with a population between 50,000 and 150,000. Pressure hydrogenation of trash is to be viewed skeptically. It remains to be seen whether the oxidizing gas generation and gasification of refuse, followed by combustion of the gas, constitutes an alternative to incineration of trash on grates. on grates.

50648 **APTIC NO. 73486**

Raschovszki, Lajos

PROCESSES IN UP-TO-DATE ELECTROFILTERS. *(Korszeru elektrofilterek folyamatai). Text in Hungarian. Epitoanyag, 26(4):138-148, 1974. 12 refs.*

Theoretical and experimental studies on electrostatic precipitators are presented. The separation efficiency of dust precipitators, as determined from the Deutsch formula, is in a certain range independent of the dust load, which means that a limitation of the residual dust concentration requires a corresponding limitation of the initial dust concentration. The separation efficiency can also be characterized by the quotient of the residence time through the migration time. The chemical compostiion and temperature-dependent changes in the electric resistivity of different dusts generated in silicate technology are being studied to optimize gas conditioning before dust separation. The corona discharge electrodes to be used for aggressive media should have protective coating, such as Vulkosil. Quartz dusts were separated efficiently by electrostatic precipitators. Homogeneous flow within the electrostatic precipitator can be achieved by adequately positioned screens and baffles.

50649 **APTIC NO. 73093**

Robson, Fred L. and Albert J. Giramonti

THE ENVIRONMENTAL IMPACT OF COAL-BASED ADVANCED POWER GENERATING SYSTEMS. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 237-257, Oct. 1974. 7 refs.*

The environmental impact of the gasified coal-fired combined cycle power systems is described. There is no difficulty in meeting the sulfur dioxide limitations with any low or high temperature cleanup systems. If a low temperature system such as polyethylene glycol ether is used, essentially all the nitrogen bearing compounds in the fuel gas would be removed and only nitrogen oxides formed from atmospheric nitrogen need be considered. Other low temperature systems remove a portion of the fuel nitrogen and even with regeneration could still meet the environmental regulations. The high temperature cleanup processes would not remove fuel nitrogen and appear to result in unacceptable emission levels. Even when the emissions are considered on a lb/MWhr basis, which takes into account efficiency advantages, the high temperature cleanup systems do not appear attractive from the environmental impact viewpoint.

50650 **APTIC NO. 70694**

Rueden, H. and K. Botzenhart

EXAMINATIONS OF THE GROWTH OF COLLECTED MICROORGANISMS ON GLASS FIBER FINE DUST AND GLASS FIBER HIGH CAPACITY AEROSOL FILTERS. *(Untersuchungen zur Frage des Wachstums abgeschiedener Mikroorganismen auf Glasfaser-Feinststaub- und Glasfaser- Hochleistungsschwebstoff-Filtern). Text in German. Gesundh.-Ingr., 95(11):318-321, 1974. 11 refs.*

Hydrophobic Hosch filter disks (diameter 5 cm) to which microorganisms were applied were exposed to laboratory air for 17 to 22 days. The air entered the filters with a speed of 2.2 cm/sec. The air throughput was 120 l/hr. At the same time microorganism carrying filter disks were exposed for the same period of time without air passing through. The experiments were carried out at relative humidities of less 70% and of 90%. As microorganisms Staphylococcus albus, Staphylococcus aureus, Streptococucus pyogenes, Streptococcus viridans, Pseudonomas aeruginosa, Serratia marcescens, Salmonelly arizona, Escherichia coli, Corynebacterium diphtheriae, Clostridium perfringens, bacillis subtilis, Clostridium septicum, and various fungi were used. In addition, glass fiber fine dust filters from air conditioning systems were examined every week for a period of 13 weeks in summer and for the same period in winter. At high as well as low relative humidities and active air flow none of the 16 microorganisms showed any significant growth during the examination period. Without air flow better living conditions prevailed for the germs because they were not reduced in number as much as with air passage through the filter. However, both types of filters examined provided no nutritive ground for germs.

50651 **APTIC NO. 70[illegible]21**

Ruggeri, Sam

PROGRESS IN SO2 EMISSION CONTROL DEVICES. *Preprint, Inst. of Electrical and Electronics Engineers, Inc., New York, p. 55-61, 1974. 12 refs. (Presented at the IEEE (Institute of Electrical and Electronics Engineers, Power Engineering Society, Summer Meeting and Energy Resources Conference, Anaheim, Calif., July 14-19, 1974.)*

The use of sulfur dioxide emission control devices as a means for reduction of SO2 from fossil fuel-fired utility boilers to comply with regulations set forth in the 1970 Clean Air Act is reviewed. The processes which are now being demonstrated in large-scale installations or being installed are reviewed. The advantages and disadvantages of different processes are discussed, and operating experience is reviewed. Processes available include throwaway and recovery processes and wet versus dry processes. Throwaway systems include limestone injection followed by wet scrubbing, limestone scrubbing, lime and waste carbide sludge scrubbing, caustic soda scrubbing followed by neutralization with lime, and sulfuric acid scrubbing followed by neutralization with limestone. Recovery systems include catalytic oxidation followed by adsorption in sulfuric acid, scrubbing with magnesium oxide followed by production of sulfuric acid, scrubbing with sodium sulfite-bisulfite followed by reduction to elemental sulfur; adsorption on copper oxide followed by reduction to elemental sulfur, and ammonia scrubbing followed by reduction to elemental sulfur. To date none of these processes has demonstrated the degree of efficiency required to match the achieved by the boilers requiring these installations. The Environmental Protection Agency has continually looked for an installation which could meet the Clean Air Act requirements and be reliable and has failed in its attempt. If throwaway systems do eventually operate well, they will cause a water pollution problem. A recovery system would therefore be the most suitable solution, but his will take longer to develop.

50652 **APTIC NO. 70628**

Saeki, Motohisa, Yoshinori Hosono, and Itsuo Yamamoto

FILTER FOR AIR CONDITIONER. *(Kuchoyo firuta). Text in Japanese. Nihon Jukagaku Kogyo Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-43631. 3p., Nov. 22, 1974. (Appl. Dec. 4, 1970, 1 claim).*

Efficient and low cost filters for an air conditioner are prepared by immersing woven or unwoven bleached cotton, synthetic fibers, or glass fiber in an aqueous solution of a sodium or potassium salt of nitrohumic acid. Nitrohumic acid is obtained by reacting peat or turf with nitric acid, from which Na or K salt is prepared. The gas adsorbability of Na or K salt is superior compared to that of humic acid. The concentration of Na or K salt of humic acid used is in the range of 1-30%. The filter immersed in the solution is dried at temperatures below 100 C to prevent the decomposition of nitrohumic acid salt. The adsorbability of gauze and bleached cotton filter immersed in 20% Na or K salt or humic acid is 0.30-0.50% for ammonia, 0.74-1.54% for hydrogen sulfide, 2.30-3.25% for carbon monoxide, and 7.10-7.30% for sulfur dioxide, indicating efficient adsorbability for toxic gases.

50653 **APTIC NO. 70641**

Sakashita, Kazuo

REGULATION AND TECHNIQUES FOR NOX CONTROL TODAY. *(NOx kisei no hoko to NOx sakugen gijutsu no genjo). Text in Japanese. Nihon Gasu Kyokai Shi (J. Japan Gas Assoc.), 27(2):18-27, Feb. 1974. 6 refs.*

In May 1973 it was decided that the one-hour value of nitrogen oxide concentration must be lowered to below 0.02 ppm within 5-8 yr, depending on the area. This is more severe than the standards set in other countries. The present NOx concentration in Japan is roughly 0.04-0.06 ppm and this will become 1.6-2.1 times higher within 5-8 yrs. To fulfill this environmental standard, 70-85% of the NOx must be removed. The present air pollution control law requires a decrease of NOx emission of about 30% from boilers and furnaces. This is not enough to satisfy the new environmental standard. Since use of fuels containing less nitrogen compounds, and lowering of oxygen concentration, temperature, and duration of combustion have been effective in decreasing NOx emission, gaseous fuel is unambiguously favored. Nitrogen content in heavy oil is 1-2% while there is no nitrogen in gaseous fuel. Low air ratio combustion, two-step combustion, and recirculation are known methods for reducing NOx. Although the necessary air ratio is 1.1-1.2 for gaseous fuel and 1.2-1.3 for heavy oil in conventional combustion, it has been lowered to 1.0 by a high speed burner developed by the Tokyo Gas Co. Ltd. With two-stage combustion the decrement of NOx was 54% in gas combustion and 36% in oil combustion. Recirculation decreases NOx emission by 66% in gas combustion, but only by 34% in oil combustion. Denitration devices are also effective and must be attached to boilers.

50654 **APTIC NO. 70589**

Schmidt, K.-H.

WILL SULPHUR REMAIN SCARCE AND EXPENSIVE? *(Bleibt Schwefel knapp und teuer)? Text in German. Chem. Ind. (Duesseldorf), 26(11): 737-743, 1974.*

Elemental sulfur has become scarce and expensive because of the worldwide rise of consumption for fertilizer. New sources for sulfur will be natural gas desulfurization plants and fuel oil and flue gas desulfurization processes. It is expected that by 1975 about 80 million tons of sulfur, and by 1980 about 100 million tons, can be gained from fuel oil desulfurization. With regard to flue gas desulfurization, no major quantities of elemental sulfur can be expected until 1980. At the beginning of 1974 the USA had 44 flue gas desulfurization plants in operation. At least 300 such facilities are necessary, however, for which 5.4 billion dollars would be needed. The goal of air pollution legislation according to which the sulfur dioxide content in roasting plants and power plants is to be reduced to between 200 and 500 ppm (emission value) will probably not be met. In view of the energy crisis the generation of sufficient quantities of electric power will have priority over waste gas desulfurization. In the Federal Republic of Germany the SO_2 immissions have been limited to 0.14 mg SO_2/cu m (long-term value) and to 0.4 mg SO_2/cu m (short term value). According to the government, waste gas desulfurization is state-of-the-art, while industry claims it is not. A court has recently supported industry s opinion. This indicates that in the Federal Republic of Germany it will be some time before flue gas desulfurization will be practiced on a larger scale.

50655 **APTIC NO. 71047**

Schreter, Robert E.

INDUSTRIAL POLLUTION CONTROL SYSTEMS AND COMPONENTS THEREOF. *(Hauck Manufacturing Co., Lebanon, Pa.) U. S. Pat. 3,819,319. 20p., June 25, 1974. 5 refs. (Appl. Aug. 23, 1973, 16 claims).*

A closed combustion system designed for connection to a furnace or the like for the purpose of afterburning gaseous pollutants is described. A heater is provided between the gaseous pollutant source and a noise attenuator connected to the combustion chamber air inlet to preclude condensation of pollutants in the attenuator. The pollutants pass from the pollutant source, through the heater and attenuator, and into a combustion chamber where they are burned. An attenuator bypass is provided to permit combustion of the pollutants in the heater and direct exhaust to the atmosphere.

50656 **APTIC NO. 70612**

Seki, Hiroji, Tetsukazu Inada, and Ikuyoshi Matsunaga

KNA NITROGEN OXIDES ELIMINATION DEVICE. *(KNA Chisso sankabutsu jokyo sochi). Text in Japanese. Sangyo Kikai (Ind. Machinery), no. 286:24-27, July 1974.*

The removal of nitrogen oxides by the oxidation absorption method was developed as a KNA process. The NOx oxidized with nitric acid is absorbed by alkali solution and a solution of alkali reducing agent. The KNA-NOx removal process consists of an oxidation tower, demister, first alkali tower, second alkali tower, and disposal water treatment tower. In the oxidation tower, NOx is oxidized with HNO_3 to regulate the nitrogen dioxide/nitric oxide ratio to one, which is the optimum ratio for alkali absorption. The highly corrosive HNO_3 mist is removed in the demister as 10% HNO_3 with 95% removal rate and can be reused In the first alkali tower, the high concentration of NOx is reduced to 400 ppm using sodium hydroxide solution. The NO_2/No ratio after the absorption is 3/2, which is suitable for absorption by alkali reducing agents. In the second alkali tower, NOx concentration is reduced from 400 ppm at the inlet to 100 ppm using alkali reducing agents such as sodium sulfide and sodium thiosulfate. The NOx absorbed as nitrites in the first and second alkali towers are decomposed with sulfuric acid and disposed of as nitrates, and the chemical oxygen demand of the disposal water is less than 20 ppm. The performance test of 50 N sq m/h capacity KNA over a 2-month period indicated that the outlet concentration of NOx was in the range of 50-200 ppm regardless of the inlet concentration (500-5000 ppm), and the removal efficiency was in the range of 90.0-97.2%. The maintenance and operational costs are less than the costs for chemicals used, and the total running cost can be reduced by recycling the recovered materials.

50657 **APTIC NO. 70699**

Shigaki, Masanobu and Hayato Shiotsuki

DEODORIZATION EQUIPMENT FOR INCINERATION FACILITY. *(Jinkai shokyakujo no dasshu sesubi). Text in Japanese. (Takurm Co., Ltd. (Japan)) Japan. Pat. Sho 49-46784. 2p., Dec. 12, 1974. (Appl. May 17, 1971, 1 claim).*

A deodorization device designed for an incineration facility, particularly for malodors from a refuse bin attached to the incinerator employs a spray washing system. The refuse bin is connected to one of the flue stacks by a main exhaust pipe with conduits leading to the furnace. In the main exhaust pipe, the blower is located before the conduit section and a damper is placed after the conduit section; each conduit is equipped with a damper. During the furnace operation, the damper in the main exhaust pipe is closed, and the malodorous air from bin is drawn by the blower and led to the furnace. When the furnace is not in operation, dampers in the conduits are closed, and the damper in main exhaust pipe is opened, leading the malodorous air into one of smoke stacks where it is deodorized while passing through several stages of water and chemical sprayers before being discharged into the atmosphere.

50658 **APTIC NO. 70548**

Shigeta, Yoshitsugu and Kozo Higuchi

DESULFURIZATION INSTALLATION FOR DIGESTING GASES FROM HUMAN WASTE TREATMENT. *(Shinyo shori ni yoru shoka gasu no datsuryu sochi). Text in Japanese. (Kyoei Koji KK, Kawasaki City (Japan) and Hokutan Kasei Kogyo KK, Toda City (Japan)) Japan. Pat. Sho 49-36341. 3p., Oct. 3, 1974. (Appl. April 2, 1970).*

A desulfurization installation is described for removal of sulfur from digesting gases (mostly methane) which result from human waste treatment. Two desulfurization-deodorization tanks, operated alternately at 15-day intervals, are connected to the digestion tank from which the gases emanate. The cyclindrical desulfurization tanks are fitted at the bottom with a conical funnel-sieve with narrow slits cut parallel to the circumference. This funnel is packed with spheroidal desulfurization agent. The bottom section of the tanks, including the funnel, and the lining of the tanks, are made of polyvinyl chloride. Untreated gases are introduced into the desulfurization tanks in the space between the funnel wall and tank wall in the bottom section of the tanks. Gases pass through the slits and through the treating material, and are piped out at the top to a storage tank. Suitable openings and connections at the top, bottom, and side of the tanks facilitate addition, regeneration, and removal of desulfurization agent. The slits and the conical packing allow more surface area of the desulfurization agent to be in contact with the untreated gases.

50659 **APTIC NO. 70210**

Simpson, Howard D.

THERMODYNAMIC INTERACTION BETWEEN TRANSITION METALS AND SIMULATED AUTO EXHAUST. *Preprint, Union Oil Co. of California, Brea, Calif., Union Research Center, 28p., 1974 (?). 12 refs.*

A computer study of the equilibrium concentrations of the major constituents in auto exhaust, and of the equilibrium relationships of various transition metals with these constituents, provides insights into the state of chemical combination expected for metals used as nitrogen oxide catalysts. The state of chemical combination of most metals is not affected appreciably by changes in air/fuel ratio in the normal range. The sulfates of many metals can form in auto exhaust at nearly all normal conditions. Sulfides and oxides can form in much of the normal range. A table presents the minimum equilibrium desulfiding and deoxiding temperatures predicted for gas containing the equivalent of 300 ppm fuel sulfur. Thus, sulfating, sulfiding, and oxidation all contribute significantly to catalyst deactivation. (Author abstract)

50660 **APTIC NO. 75247**

Slack, A. V.

SECOND GENERATION PROCESSES FOR FLUE GAS DESULFURIZATION. INTRODUCTION AND OVERVIEW. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-b, p. 1029-1048, Dec. 1974. (Nov. 4-7.)*

Second generation flue gas desulfurization processesare discussed in terms of their merits and drawbacks with respect to each other and first generation processes. Processes in the less developed second generation category are grouped under the general heading lime/limestone scrubbing, double alkali scrubbing, and recovery processes generating sulfur as a byproduct. Although second generation approache in lime/limestone scrubbing are not likely to have as much impact as the double alkali and recovery type processes, the promise of lower cost and superior product may give the processes an important role. The impact of second generation processes in the two- stage throaway field is not very clear, and two stage process may not be able to compete with direct lime/limestone scrubbing. Processes based on sodium or ammonium compounds a absorbents, however,show the advantage of very high sulfur dioxide absorption. All of the second generation recovery methods are capable of producing elemental sulfur, a decided advantage over some of the first generationrecovery processes. However, definite comparisons between individual processes cannot be made due to insufficient test data.

50661 **APTIC NO. 71275**

Stephens, D. R., A. Pasternak, and A. Maimoni

THE LLL IN SITU COAL GASIFICATION PROGRAM. *National Coal Assoc., Washington, D. C., Coal Util. Symp. - Focus SO2 Emiss. Control, Louisville, Ky., 1974, p. 17-29. 17 refs. (Oct. 22-24.)*

An in-situ coal gasification concept which appears to offer both economic and environmental advantages is described. The concept involves using chemical explosives in an array of drilled holes to fracture coal at depths from 1000-2000 ft. The top of the resulting permeable fracture area is ignited, and a steam-oxygen mixture is then continuously supplied at 500-1000 psi pressure. The concept essentially represents an underground packed bed reactor. Coal in the fractured bed is gasified with steam and oxygen as in conventional high-BTU coal gasification, with the gases produced underground being treated in a surface facility to produce pipeline-quality gas. Assuming that a permeable, fractured coal bed in an otherwise impermeable medium permits intimate mixing of the coal and reactants and allows heat transfer and reactant access to all of the coal, the entire amount of coal in the fractured bed is gasified, not bypassed or carbonized. The impermeable surroundings minimize leakage of reactants and products from the fractured zone, and higher pressures which favor methane formation are possible. Vertical gasification from the top down creates a convectively stable reaction zone. The projected selling price of the gas ranges from 40 to 70 cents/MCF, about half the cost of gas from the existing Lurgi process. (Author abstract modified)

50662 **APTIC NO. 70713**

Suneja, S. K. and C. H. Lee

AEROSOL FILTRATION BY FIBROUS FILTERS AT INTERMEDIATE REYNOLDS NUMBERS (LESS THAN OR EQUAL TO 100). *Atmos. Environ., 8(11): 1081-1094, Nov. 1974. 26 refs.*

Aerosol filtration studies involving the computation of collisional efficiencies for spherical aerosol particles impacting on a cylindrical fiber in the intermediate range of Reynolds numbers (less than or equal to 100) were performed. The complete Navier-Stokes equations were solved using a successive overrelaxation method to obtain the flow field around the fiber.

Calculations were performed for Reynolds numbers of 1, 10, and 60, Stokes numbers of 1, 2.81, 7.14, and 20, and particle to fiber radii ratios of 0, 0.05, 0.1, and 0.15. The particles followed a more or less straight line path except near the fiber surface (distance equal to one fiber radius) where the trajectory curvature increased with decreases in Stokes number. Thus, fewer particles will collide with the fiber as the Stokes number decreases. Particle trajectories become flatter with an increase in Reynolds number; thus, more particles will collide with fiber as the Reynolds number is increased. The calculated collision efficiencies for finite Reynolds numbers are between those for potential and viscous flow as expected. The results of this analysis can be applied to removal of particles on an industrial basis.

50663 **APTIC NO. 70386**

Svensson, K.

MODERN HOODS FOR HIGH DEW POINTS IN MULTICYLINDER DRYERS. *(Die moderne Dunsthaube fuer hohen Taupunkt bei Mehrzylinder-Trockenpartien). Text in German. Papier (Darmstadt), 28(12):549-552, 1974.*

The heat consumption during paper drying in a multicylinder dryer is calculated for different dew points of the exhaust air. The system investigated consists of a closed hood with a heat exchanger air/air in which the supply air of the hood is heated by the exhaust air. The size of the heating surface of the heat exchanger is optimized for a dew point of 60 C in order to achieve maximum efficiency. If the heating surface thus calculated is operated at a dew point of 52 C, heat consumption increases by 5.6%. An exchanger for circulating water can be placed behind the exchanger air/air in the exhaust air stream. In a new system the circulating water heats the ventilation air of the machine room.

50664 **APTIC NO. 70652**

Takahashi, M., M. Shimoda, and F. Nishisaka

TREATMENT OF DUST FROM CUPOLA. *(Kyupora no baijin no shori ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):430, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 281.)*

There were more than 180 cupola furnaces at 140 plants in Osaka Prefecture (excluding Osaka city), and 27 furnaces failed to meet the Prefectural regulations on pollution control. About half of the furnaces used venturi scrubber and more than 50 of the furnaces used bag filters for dust collection. Both types of dust collectors were recommended by the Prefectural government. Venturi scrubbers have the advantages of small space required and satisfactory dust removal (0.13-0.20 g/N cu m after treatment), but the disadvantages are secondary pollution such as waste water and noise. Bag filters have the advantages of high performance (0.03-0.10 g/N cu m), but disadvantages of large space and high cost.

50665 **APTIC NO. 70335**

Takayasu, Masami, Kyoichi Kanzaki, Yoshiaki Annen, and Yoshiro Morita

CATALYTIC REACTION OF NO (4) EFFECTS OF O2, CO, SO2 ON NH3 REDUCTION. *(NO no sesshoku hanno (4) NH3 kangen ni okeru 02, CO, SO2 no eikyo). Text in Japanese. Preprint, Japan Chemical Society, Sendai, p. 652, 1974. 1 ref. (Presented at the Japan Chemical Society, Fall Meeting, 31st, Sendai, Japan, Oct. 2-5, 1974, Paper 2Q14.)*

The influence of oxygen, carbon monoxide, and sulfur dioxide on the catalytic reduction of nitric oxide by ammonia was investigated. On cooper oxide-alumina catalyst, the conversion rates of NO and NH3 were both 100% for the NO-NH3 reaction at temperatures above 300 C. Reversible adsorption of NO and NH3 occurred on the CuO-alumina catalyst. More NH3 than NO was adsorbed. In the presence of CO or SO2, NH3 adsorption was suppressed. In the reaction NO-NH3-O2 (10%) at 200-300 C, NO reduction was over 90%. As reaction temperature increased, the combustion reaction for NH3 became predominant. At temperatures above 500 C, no reduction of NO by NH3 occurred. Instead, only the oxidation reaction by O2 was present.

50666 **APTIC NO. 70346**

Takayasu, Masami, Yoshiaki Annen, Kyoichi Kanzaki, and Yoshiro Morita

CATALYTIC REACTION OF NO (5). EFFECTS OF CO AND SO2 ON CATALYTIC OXIDATION. *(NO no sesshoku hanno (5). Sesshoku sanka ni okeru CO, SO2 no eikyo). Text in Japanese. Preprint, Japan Chemical Society, Sendai, P. 653, 1974. 1 ref. (Presented at the Japan Chemical Society, Fall Meeting, 31st Sendai, Japan, Oct. 2-5, 1974, Paper 2Q15.)*

Contact catalysis of nitric oxide on metal oxide catalysts was investigated. Most active catalysts were platinum, chromium, and cobalt. Inferior catalysts were copper, sulfates, and manganese/active carbon. Oxidation of carbon monoxide in the NO-CO-oxygen system reached 100% at temperatures near 200 C, on Pt and Co catalysts. However, NO-CO reaction proceeded at lower temperatures on Co than on Pt. In the presence of CO, oxidation of NO to nitrogen dioxide decreased on Pt catalysts, but increased on Co catalysts.

50667 **APTIC NO. 70323**

Tanaka, Chuji, Fumio Yamaguchi, and Takao Shirokura

A STUDY ON LIQUID CYCLONE----DESIGN AND OPERATION CONDITIONS AND PERFORMANCE. *(Ekitai saikuron ni kansuru kenkyu----sekkei sogyo joken no taisuru shoseino ni tsuite). Text in Japanese. Preprint, Japan Agency of Industrial Science and Technology, Pollution and Resources Research Inst., p. 42-44, 1974. (Presented at the Pollution and Resources Research Institute, Study Meeting, 3rd, Kawaguchi, Japan, July 9-10, 1974.)*

The effects of charging slurry concentration, particle size, particle composition, and inlet pressure on the performance of a liquid cyclone were investigated using a closed system in which the inlet pressure is controlled by varying the rotational frequency of pump. The major factor affecting performance is the ratio of the inner diameter of the overflow finder (Do) to the underflow nozzle diameter (Du). The cyclone diameter is the determining factor for the treatment volume of slurry. The collecting efficiency is proportional to Du/Do in the range of Du/Do equals 0.4-1.0. The particle size separated decreases with the increase in Du/Do and with the decrease in charging slurry concentration in 5-30 wt% range. As for the concentration performance, the maximum slurry concentration is approximately 70-85%, and the concentration efficiency is higher with lower charging slurry concentration. The clarifying efficiency of overflow slurry decreases with the increase in Du/Do value.

50668 **APTIC NO. 70644**

Teggers, Hans

HYDROGASIFICATION OF COAL. *(Hydrierende Vergasung von Kohle). Text in German. Gas Wasserfach, Gas/Erdgas (Munich), 115(12): 532-537, 1974. 6 refs.*

For testing the hydrogasification of soft and hard coal with process heat from high temperature nuclear reactors under pressure in a fluidized bed, a scaled experimental plant with a capacity of about 100 kg coal/hr is presently being erected and is scheduled for completion in January of 1975. This experimental plant has been designed on the basis of past experiences with conventional coal gasification processes in fluidized bed reactors and on the results from preliminary tests in a tubular reactor with a diameter of 200 mm. These preliminary tests showed that wit dry soft coal with grains of zero to 1 mm diameter a homogeneous fluidized bed could be produced at gas velocities of 2-3 to 10 cm/sec and a depth of the bed of 400 cm. No major emission of fine dust was observed at any of the tests. Two process versions for the production of methane from soft coal are described. The first version processes soft coal in a fluidized bed with hydrogen under pressure at temperatures around 850 C. The crude gas obtained from this process contains 63% hydrogen, 32% CH4, 4% carbon monoxide and small amounts of carbon dioxide, nitrogen, and hydrogen sulfide. After passage of heat exchangers for steam production, the crude gas is liberated from fine dust and tar and in a subsequent gas scrubber from CO2 and H2S. The second version processes the coal with a mixture of hydrogen, carbon monoxide, and water vapor at 800 C. The crude gas in this case consists of 38% H2, 21% CH4, 16% CO2, 15% CO, 10% N2, and small amounts of H2S.

50669 **APTIC NO. 70601**

Tsuji, T., T. Okuno, and Y. Shintani

REMOVAL OF ODOR FROM LEATHER MAKING BY ADSORPTION ON ACTIVATED CARBON. *(Hikakukojo yori hassei suru shuki no kasseitan ni yoru dasshu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):469, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 318.)*

To explore the possibility of using commercial activated charcoal for the deodorization of stack gases from leather processing plants, a small deodorization device consisting of two adsorption towers was developed, and removal rates of hydrogen sulfide, methyl mercaptan (MM), dimethyl sulfide (DMS) were measured by flame photometric gas chromatography. The variation in H2S, MM, and DMS concentrations with linear velocity was measured at the inlet and outlet of the first and second adsorption towers. The removal rates were above 99% for H2S, 100% for MM and 50-99.6% for DMS. The H2S and MM are presumed to be converted to S and MSSM in the presence of oxygen and steam, respectively. Analysis results of H2S, MM, and DMS concentrations produced at various stages of leather processing are given.

50670 **APTIC NO. 70693**

Ueda, Masaru

ACTUAL STATE OF ORGANIC SOLVENT RECOVERY AND HARMFUL GAS OFFENSIVE ODOR REMOVAL BY ACTIVATED CARBON ADSORPTION METHOD. *(Kasseitan Kyuchaku ni yoru yukiyozai no kaishu to yugaigasu, akushu jokyo no jissai). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(4):67-72, April 1974. 4 refs.*

In a plant designed for recovery of organic solvents by activated carbon adsorption, air mixed with a solvent gas is cooled to 40 C or below by a gas cooler and blown into an adsorption column by a gas blower. The gas should be cooled to a sufficiently low level for a higher rate of adsorption. For wasteless input of the solvent gas into the adsorption column, the solvent gas generation source should be set to a pressure level somewhat lower than the atmospheric pressure. The blower and the duct connecting the blower to the adsorption column should be made of materials hard to flash with static electricity and sparks. The motors, lighting, and switches must be protected by anti- explosion devices. Several adsorption columns are used in one plant, depending on quantity of the solvent to be recovered and on the operating conditions. The solvent gas is treated by the activated carbon layer in the adsorption column to remove the solvent from the gas. The treated gas now free of the solvent is discharged into the atmosphere. When one adsorption column has adsorbed the solvent to its saturation point, another adsorption column will be used until saturated. The saturated column is regenerated by low-pressure steam fed into it for desorption of the adsorbed solvent from the activated carbon layer. The mixture gas of the solvent vapors and water vapors driven out of the adsorption column is cooled by the condenser and after-cooler and recovered as a liquid. A few of the small-, medium-, and large-sized solvent recovery plants introduced include the Cubical Basket Adsorption Equipment, the Sector Basket Adsorption Equipment, the Cylindrical Basket Adsorption Equipment, and the Closed System Adsorption Equipment. The safety measures and devices to prevent possible explosion are described. Odor removal by activated carbon adsorption is also discussed.

50671 **APTIC NO. 69001**

Urano, Sotaro and Osamu Katsumata

SULFUR DIOXIDE GAS ELIMINATION FILTERS. *(Aryusan gasu jokyo firuta ni tsuite). Text in Japanese. Kenchiku Setsubi (Architectural Equipment), 25(7):28-30, July 1974. 5 refs.*

The sulfur dioxide removal devices for air regulators used in ventilation system of buildings are described. Four types of cleansing devices are the activated charcoal filter, the catalytic filter (manganese dioxide plus metallic oxides), the alkali coated filter, and the air washer. In the activated charcoal method, SO2 is removed by the adsorption and catalytic reaction. The removal efficiency varies with the relative humidity. In the catalytic filter method, a mixture consisting of manganese dioxide and cupric oxide, silver oxide, or ferric oxide is coated on non-woven cloth or used as granules. In the alkali coated filter method, SO2 is removed by the neutralization reaction with an alkali such as sodium hydroxide or sodium carbonate. In the washer method, SO2 is removed by dissolving in water sprays. On the alkali coated filter, the effects of inlet concentration, dust adsorption, humidity, and temperature on the removal efficiency were investigated. The alkali coated filter is also effective for the removal of other acidic gases, and has a sterilization effect. The types and performance of the commercially available alkali coated filters, Air Clean Model-P and Air Clean Model A, are described with schematic diagrams and experimental data on removal efficiency of SO2.

50672 **APTIC NO. 71057**

Voogd, Maarten

SMOG CONTROL SYSTEM AND METHOD. *(Assignee not given.) U. S. Pat. 3,818,876, 7p., June 25, 1974. 4 refs. (Appl. May 29, 1973, 5 claims).*

A system for continuously introducing an emulsion of water and gasoline into an internal combustion engine for the purpose of reducing the reaction temperature and thus nitrogen oxide formation is described. The system includes: an emulsifying chamber for storing gasoline and water, a rotary stirring means in the emulsifying chamber, a carburetor having a fuel chamber in communication with the emulsifying chamber, a means for delivering the emulsion from the emulsifying chamber to the carburetor fuel chamber, and a means for continuously providing uninterrupted recirculation of a portion of the emulsion accumulated in the carburetor fuel chamber to the emulsifying chamber to prevent the gasoline and water emulsion from separating as it accumulates in the carburetor fuel chamber.

50673 **APTIC NO. 73477**

Voronin, D. I. and V. G. Shishkin

COMBUSTION OF INDUSTRIAL GASEOUS WASTE PRODUCTS IN INDUSTRIAL INSTALLATIONS. *(Szhiganie gazoobraznykh otkhodov proizvodstva v promyshlennykh ustanovkakh). Text in Russian. Prom. Energ., no. 1:15-17, 1974. 2 refs.*

The incineration of industrial waste gases containing carbon monoxide, vapors of acids, aldehydes, ketones and alcohols in an industrial power plant boiler model TS-35-39U was studied. The waste gas, generated at a rate of up to 10,000 cu m/hr, was admitted into the furnace in a ratioof 4 to 5 cu m per cu m of natural gas. The admission of the waste gas in this proportion did not reduce the dependability of the boiler operation.

50674 **APTIC NO. 75225**

Weir, Alexander, Jr., John M. Johnson, Dale G. Jones, and Spencer T. Carlisle

THE HORIZONTAL CROSS FLOW SCRUBBER. *Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Lab., Flue Gas Desulfurization, Proc. Symp., Atlanta, Ga., 1974, Program Element 1AB013, ROAP 21ACX-AA, Rept. EPA-650/2-74-126-a, p. 357-387, Dec. 1974. 1 ref. (Nov. 4-7.)*

NTIS: PB 242572/AS

Operating experience with a 475,000 scfm horizontal cross-flow lime scrubber at an electrical generation facility is reviewed. Sulfur dioxide removal efficiencies of 90% were achieved at a liquid to gas contacting ratio of about 17.5 gallons/1000 scf, using four stages of scrubbing. The sulfur content of the coal burned at the steam plant averaged 0.38%, resulting in an average stack SO2 concentration of 200 ppm. Overall availability of the scrubber unit was calculated at 85.4% over a test period of 5003 hr.

50675 **APTIC NO. 71053**

Whitman, Robert Henry and Edward Leyman

CATALYST FOR THE ELIMINATION OF POLLUTANTS IN EXHAUST GASES; CATALYST RESISTANT TO SULFUR POISONING; CATALYST CONTAINING AN EVEN DISTRIBUTION OF PROMOTERS. *(American Cyanamid Co., Stamford, Conn.) U. S. Pat. 3,819,533. 6p., June 25, 1974. 3 refs. (Appl. May 18, 1972, 9 claims).*

A catalyst for the oxidation of exhaust emissions from internal combustion engines is described that, unlike prior-art catalysts, resists poisoning by sulfur oxide compounds in the exhaust. The catalyst material consists of an alumina support stabilized with a sufficient amount of alkaline earth metal to provide for about 1.5-10% by weight of alkaline earth metal oxide upon calcination at 1800 F. The stabilized alumina support is uniformly impregnated with 2-10% by weight of cupric oxide and from 2-10% by weight of chromic oxide as a first promoter. A second promoter consisting of 0.0025-0.1% by weight of palladium is then applied.

50676 **APTIC NO. 70296**

Yajima, T., K. Hishida, H. Nihei, T. Kubota, and M. Kubota

THE ECONOMICS OF SULFUR OXIDE CONTROL PROCESSES. *(Haien datsuryu sochi no genjo to keizaisei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):446, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 297.)*

Survey results are tabulated for the status of desulfurization installations throughout Japan from 1964 to the present. Of the 456 industrial and building heating installations, 75.2% used sodium hydroxide absorption and adsorption methods to convert sulfur oxide to sodium sulfite and sodium sulfate. Use of NaOH and calcium hydroxide to form calcium sulfate accounted for only 8.8% of the installations. Desulfurization by formation of ammonium sulfite, ammonium sulfate, and sulfuric acid was effected at various other installations. The cost of desulfurization per hour for volume of fuel used per hour is plotted on a graph.

50677 **APTIC NO. 70700**

Yamamoto, Kenichi

DEVICE FOR CONTROLLING TOXIC GAS EMISSION FROM ROTARY PISTON ENGINE. *(Rotari pisuton enjin no yugai seibun hoshutsu boshi sochi). Text in Japanese. (Toyo Kogyo Co., Ltd., Hiroshima (Japan)) Japan. Pat. Sho 49-43741. 3p., Nov. 22, 1974. (Appl. March 10, 1971, 2 claims).*

To prevent the emission of toxic components in exhaust gas, particularly during the initial period of engine operation in a rotary engine equipped with a thermal reactor or catalytic converter, the side of the compression chamber and exhaust port are connected by a conduit with a pressure controlled valve located near the compression chamber. At a given pressure, the valve is opened and a portion of compressed fuel mixture is discharged into the exhaust port, mixed with exhaust gas, and led to the thermal reactor. The temperature in the thermal reactor is low in the initial period, however, the recombustion is facilitated by the addition of fuel mixture, thus raising the temperature promptly and preventing the emission of incompletly combusted components. However, the continuous supply of fuel mixture results in a slight loss in fuel and engine output. Therefore, a temperature-controlled valve may be placed in the conduit; it closes when the thermal reactor reaches a certain temperature.

50678 **APTIC NO. 69058**

Yamamoto, Ryutaro

PREVENTATION OF AIR POLLUTION BY OFFSET ROLLER EXHAUST GASES. *(Ofusetto rintenki ni okeru haiki gasu taiki osen boshi). Text in Japanese. Insatsu Zasshi (Print. J.), 57(3):3-8, March 1974. 2 refs.*

Several effective control methods for offset roller exhaust gases are disscussed. Some of them have been developed by the printing department of Ambassador College in California. The three methods discussed are afterburner, catalysts, and heat exchange (returning the heat to the dryer). The afterburner for the TEC dryer designed for the offset roller controls exhaust gas by 95%. The catalyst developed by Ambassador College, a honeycomb type alloy of aluminum, platinum, and rhodium(?) is effective in dropping the combustion temperature to 400 C and lowering the cost. The use of catalyst very much depends on the position necessary to prevent change of the alloy consistency. A graphic press using an Owen Afterburner is successful in eliminating 95% of solvent exhaust gas; the dryer exhaust is burned at 760 C; the fuel is sometimes supplemented by propane gas due to the fuel shortage. The installation cost was very high. Use of a dryer with offset roller ink will not control emission of solvent exhaust gas; one method of control is the use of the new type solventless ink. The ultraviolet dry ink is one representative product which, however, still presents many problems such as high cost, short performance life, and the formation of ozone. The most efficient system at the moment seems to be the use of heat set ink, a dryer, and an afterburner with a catalyst. The factors to be considered and the offset printing line area size, ink film thickness, press speed, and dryer capacity.

50679 **APTIC NO. 70659**

Yamashita, Hachiro and Yasuo Kobayashi

FURNACE GAS COLLECTION METHOD IN ALUMINUM ELECTROLYSIS BATH. *(Aruminyumu denkaiso ni okeru rogasu saishu hoho). Text in Japanese. (Mitsubishi Kasei Kogyo Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-43046. 3p., Nov. 19, 1974. 1 ref. (Appl. April 14, 1970, 1 claim).*

The use of a gas curtain for collecting furnace gas containing toxic fluorine compounds and carbon monoxide from an aluminum electrolytic furnace is described. Between the side casing of the vertical anode and side insulator for the horizontal carbon cathode, a gas curtain is created diagonally covering the area from the side insulator of the carbon cathode, crust, and skirt of vertical casing wall for the anode and part of the vertical casing wall. A gas injection port may be located on the vertical casing wall and gas suction port on the insulator, or vice versa. The furnace gas trapped by the gas curtain is led to a gas cleansing device by suitable means, thus preventing the discharge of toxic furnace gas into the furnace room.

50680 **APTIC NO. 70629**

Yanagi, F.

BOILER EQUIPMENT. *(Boira sochi). Text in Japanese. (Mitsubishi Jyukogyo Co., Ltd., Tokyo (Japan)) Japan. Pat. Sho 49-43721. 4p., Nov. 22, 1974. (Appl. Dec. 15, 1970, 1 claim).*

For the purpose of reducing the concentrations of air pollutants in boiler exhaust gas, the recirculated exhaust gas mixed with air is injected into boiler through a nozzle with a tilting mechanism located at the top of the burner section. The flow rate of recirculated exhaust gas and the tilting angle of the nozzle are controlled by feedback control signals based on pollutant concentrations measured by analyzers. The concentrations of nitrogen oxides, carbon monoxide, dust, sulfur trioxide, and smoke density are measured simultaneously; the information obtained is analyzed in terms of pollution effect; and control signals for minimizing overall pollution are fed back to the control systems for altering the flow rate of recirculated exhaust gas and the tilting angle of the nozzle.

50681 **APTIC NO. 73097**

Yavorsky, P. M. and Sayeed Akhtar

ENVIRONMENTAL ASPECTS OF COAL LIQUEFACTION. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFI, p. 325-330, Oct. 1974. 4 refs.*

The effluents for the SYNTHOIL process, as typical of any coal-to-oil conversion plant that incorporates sulfur removal from the product, are discussed. The principal impurities from the off gas from a coal liquefaction reactor are methane, ethane, hydrogen sulfide, ammonia, and water. The impurities in the gasification products of carbonaceous residues and coal are another source of gaseous effluents. The liquefaction plant has gaseous effluents from the mixer, the solids separator, and the pyrolyzer consisting mainly of hydrocarbon gases and vapors, hydrogen, NH3, and H2S. Finely divided solids will become airborne during transfer of coal from delivery trains to storage hoppers, pulverization of coal, and transfer of ash and sulfur from storage hoppers to disposal trains. Dust control methods include baghouse filters, suction devices, and water sprays. The potential hazards of contaminants in product oil and in any leachable residues are examined to show where chemical data and/or process design alternatives may be needed. (Author abstract modified)

50682 **APTIC NO. 70547**

Nittetsu Kakoki Co., Ltd., Equipment Sales Div. (Japan)

SYSTEM FOR RECOVERY/REUSE OF ORGANIC SOLVENTS BY ACTIVATED CARBON ADSORPTION. *(Kasseitan Kyuchakuho ni yoru yukiyozai no kaishu saishiyo shisutemu). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(4):61-66, April 1974. 6 refs.*

Organic solvents that can be recovered by means of the activated carbon adsorption method include practically all kinds of the solvents used in industry today. Among them are petroleum naphtha, solvent naphtha, mineral spirit, petroleum ether, hexane, heptane, bezene, toluene, xylene, methyl acetate, and numerous others. Adsorbability varies with the molecular structure of the solvent; side chain compounds are more easily adsorbed than straight chain compounds, aromatics are generally more easily adsorbed than aliphatics if the molecular weight is identical, and the effect of a substitution radical on adsorbability depends on its location. In designing a solvent recovery system measures to prevent possible explosions should be considered. The respresentative explosion hazards involved in the recovery system include accidents in the flower or other revolving units, spark from electrical units, static electricity, temperature rise caused by adsorption heat in the activated carbon layers, temperature rise caused by oxidation and decomposition heat of the solvent in the activated carbon layers, and formation of peroxides. The flow sheet of a typical solvent recovery plant using the activated carbon adsorption method is shown. The main component units of the plant include the adsorber, the raw gas filter cooler, the condenser/cooler, the decanter, the recovery tower, the dewatering tower, the separation tower, the reboiler, the blower, and the pump. Formulae used to calculate the required thickness of the activated carbon layer in a given equipment are described.

50683 **APTIC NO. 73039**

Perathon, Inc., Alexandria, Va., Pope, Evans and Robbins

MULTICELL FLUIDIZED-BED BOILER -- MONTHLY PROGRESS REPORTS NOS. 19 (APRIL 1974) THROUGH 21 (JUNE 1974). *Office of Coal Research Contract 14-32-0001-1237, 207p., Oct. 1974.*

NTIS: PB-235 847

Monthly progress reports on a program to develop a multicell fluidized bed boiler are presented. The objective of the program is to design, construct, and test a 300,000 lb/hr capacity multicell fluidized-bed boiler, as a pollution-free method of burning high-sulfur coal or burning highly corrosive coals without excessive maintenance problems. Sulfur dioxide in the fluidized-bed boiler is actually controlled by the use of limestone as bed material. The limestone is kept reactive either by regeneration to cover SO2 in useful concentrations or by adding a low-cost catalyst (common salt) with the coal. (Author abstract modified)

50684 **APTIC NO. 73135**

Pope, Evans and Robbins, Alexandria, Va.

DEVELOPMENT OF COAL FIRED FLUIDIZED-BED BOILERS. MONTHLY PROGRESS REPORTS NOS. 45 (NOVEMBER 1968) THROUGH 54 (AUGUST 1969). *Office of Coal Research Contract 14-01-0001-478, Repts. 45-54, 233p., Oct. 1974.*

NTIS: PB 235899

Progress in the development of a 250,000 lb/hr fluidized-bed boiler that achieves efficient capture of gaseous pollutants is described in 10 monthly reports. Preliminary experiments indicate that boilers of this design develop from five to 10 times the amount of steam produced by conventional boilers of equivalent size; thus the size and cost of fluidized-bed units can be reduced to a fraction of pulverized coal units. Emissions data are given for sulfur oxides, nitrogen oxides, hydrocarbons, and particulates; the addition of limestone to the bed results in sulfur dioxide reductions of between 29 and 62%, though particulate emissions double as a result of the addition.

50685 **APTIC NO. 73151**

Pope, Evans and Robbins, Alexandria, Va.

MULTICELL FLUIDIZED-BED BOILER - MONTHLY PROGRESS REPORTS NOS. 1 (OCTOBER 1972) THROUGH 9 (JUNE 1973). *Office of Coal Research Contract 14-32-0001-1237, Repts. 1-9, 206p., Oct. 1974.*

NTIS: PB 235844

Progress in the design, construction, and operation of a full-scale multi-cell fluidized-bed boiler is described in nine monthly reports. The experimental 300,000 lb/hr capacity multicell fluidized-bed boiler is envisioned as a pollution-free method of burning high-sulfur coal or burning highly corrosive coals without excessive maintenance problems. Sulfur dioxide in the fluidized-bed boiler is controlled by the use of limestone as bed material. The limestone is kept reactive either by regeneration to recover sulfur dioxide in useful concentrations or by adding a low-cost catalyst (common salt) to the coal.

1973

50686 **APTIC NO. 72951**

Bagley, R. D., R. C. Doman, D. A. Duke, and R. N. McNally

MULTICELLULAR CERAMICS AS CATALYST SUPPORTS FOR CONTROLLING AUTOMOTIVE EMISSION. *Preprint, Society of Automotive Engineers, Inc.,* *New York, 9p., 1973. (Presented at the Society of Automotive Engineers, International Automotive Engineering Congress, Detroit, Mich. Jan. 8-12, 1973, Paper 730274.)*

The basic flow and heat transfer properties of monolithic multicellular ceramic structures are described and related to their use as supports for cataysts to control automobile pollutants. Characteristics that make multicellular ceramics particularly suitable as catalytic supports for controlling exhaust emissions include: smaller size, faster heat-up, lower back pressure, lower vibration attrition, and design flexibility. A corderite-mullite system possesses the desirbale properties of both low expansion and high use temperature; however, the choice of the composition is a compromise between these two properties. The extrusion technique for manufacturing monoliths is fast and efficient, yielding a uniform, reproducible product. Monoliths must be desgined as part of a total system since the coating, catalyst, mounting technque, and engine all contribute to the success or failure of the monolithic system.

50687 **APTIC NO. 70672**

Bauerle, George L. and Ken Nobe

TWO-STAGE CATALYTIC CONVERTER. STEADY-STATE OPERATION AS A LIMITING CONDITION. *Ind. Eng. Chem. Process Design Develop., 12(2):137-141, 1973. 6 refs.*

Steady-state modeling of a two-stage catalytic exhaust converter was developed for use in the preliminary design of the converters to establish limiting conversion for a given set of operating conditions. The adiabatic assumption was justified for converters of practical size. A graphical method for solution of the material and energy balances was developed. The conversion and temperature determined by the graphical method were in close agreement with values calculated by numerical methods. (Author abstract modified)

50688 **APTIC NO. 70223**

Bilger, R. W.

CONTROL TECHNIQUES FOR AUTOMOTIVE EMISSIONS. *Clean Air Society of Australia and New Zealand, New South Wales Branch, Air Pollut. Control Instrum., Proc. Symp., Sydney, Australia, 1973, p. 3-1 to 3-40. 25 refs. (Sept. 18, Paper 3.)*

The technology for control of emissions from new and in-use motor vehicles is surveyed with particular emphasis on their applicability in Australia. The use of transportation controls to reduce overall vehicle emissions is also discussed. Emission controls for in-use vehicles include inspection and maintenance programs; retrofit various devices such as engine operation modifications, vacuum spark disconnect, exhaust gas recirculation, and catalytic converters; and use of gaseous fuels such as liquefied petroleum gas and natural gas. Established control techniques for new cars include engine modifications; air injection; exhaust gas recirculation; recovery of fuel vapors and carburetor hydrocarbon emissions; and positive crankcase ventilation. Future control techniques for new cars include catalytic reactors and new engine concepts as stratified charge engines; gas turbines; and Wankel engines. Other transportation controls involve improvement of traffic flow, by passing through-traffic, improving public transportation, motor vehicle restraints, work schedule changes, and land use changes. The following control recommendations are made for Australia and in particular the Sydney region: a further tightening of new car emission standards to give 90% control of exhaust hydrocarbons and carbon monoxide and 50% control of nitrogen oxides; a regular emission inspection of 1972 and subsequent model cars to ensure idle CO compliance; conversion of taxis and commercial fleets to gaseous fuels; car-free zones and more pedestrian malls to be made in city centers; and certification of suitable retrofit control devices to give at least 50% control of HC and CO for 1968 to 1973 model cars with a view to making their installation mandatory. (Author summary modified)

50689 **APTIC NO. 72948**

Briggs, Warren S. and James R. Graham

THE SINGLE STONE-MONOLITH SUBSTRATE AS A CATALTYIC UNIT FOR AUTO EMISSION CONTROL. *Prerint, Society of Automotive Engineers, Inc., New York, 8p., 1973. 6 refs. (Presented at the Society of Automotive Engineers, International Automotive Engineering Congress, Detroit, Mich., Jan. 8-12, 1973, Paper 730275.)*

The application of single stone-monolith catalytic substrates to automobile emission control (oxidation of hydrocarbons and carbon monoxide) is discussed, with particular emphasis on physical and chemical properties affecting catalyst performance and durability. A monolithic substrate coated with a thin layer of active alumina spread uniformly over the geometric surface permits an active metal such as platinum to be nearly monotomically dispersed, thus serving to optimize catalytic efficiency. Laboratory tests indicate that nearly complete conversion of CO and hydrocarbons occurs in time intervals of as little as 10-50 milliseconds with monolithic converters. Problems that remain in monolith development include cracking from stresses, internal melting as a result of uncontrolled exotherms, and difficulties arising in the mounting between the monolith and steel container.

50690 **APTIC NO. 70870**

Engineer, N. B. and V. C. Doshi

AIR POLLUTION IN CEMENT INDUSTRY. *Central Labour Inst., Sion, Bombay (India), Proc. Semin. Air Pollut. Control Tech., India, 1973, p. 167-180. 3 refs. (Sept. 11-12.)*

Air pollution control in the cement industry is reviewed, with operations responsible for excessive dust nuisance being identified. The size of dust particles typically encountered in cement operations ranges from as low as 1 micron to as high as 100 micron. Water spraying is used to control dust at limestone crushing plants, though for larger plants dust collection by cyclones or bags appears necessary. Bag filters are used for dusts generated at grinding mills; cyclones are not effective due to the very fine particle size (50 micron and below) encountered in these operations. Depending on the type of kiln, either settling chambers or electrostatic precipitators are used in these areas. Cyclones are also sometimes used. Electrostatic precipitation is not entirely satisfactory since dry process kilns with preheater temperatures of about 330 C do not meet the conditions for optimum precipitation (90-180 C, 15-30% moisture). Dust from cement packing and despatch is controlled by bag filters and by proper handling of the cement bags during transfer. Dryer operations are normally provided with cyclones, though the efficiency of collection is only about 80%. Bag filters cannot be used because of the fire hazard. Water scrubbers are employed at some cement plants for cleaning coal-laden air and are proving quite effective.

50691 **APTIC NO. 73033**

Haimov, H. A.

NITROGEN OXIDE EMISSIONS FROM STATIONARY NATURAL GAS POWERED ENGINES. *Preprint, American Gas Assoc., New York, 34p., 1973. (Presented at the American Gas Association Transmission Conference, El Paso, Tex., April 16-18, 1973.)*

Various nitrogen oxide emission controls were texted on several two- and four-cycle, piston-type, natural gas-powered stationary engines, as well as on two natural gas turbine engines. Horsepower reduction was the most effective method tested, though it suffered from the obvious drawback of reduced capacity. Exhaust recirculation was the next most effective method, notwithstanding a number of operating complications. Also effective in reducing NOx emissions were air injection, variable spark advance, reduced torque, air/fuel adjustment, and the installation of a catalytic muffler. Water injection was not effective, and reducing the amount of scavenging air was counterproductive. Decreasing the load on turbine engines resulted in lower emissions as with piston engines, though the rate of decrease was relatively low in comparison with the latter. Among the piston-type engines, the four-cycle ones as a group proved to be heavier polluters than the two-cycle units.

50692 **APTIC NO. 70821**

Lewis, P. S., R. J. Belt, and A. J. Liberatore

LOW-BTU FUEL GAS FOR POWER GENERATION. *Bureau of Mines Information Circ., no. 8650:220-228, 1973. 3 refs. (Presented at the Technology and Use of Lignite, Bureau of Mines - University of North Dakota Symposium, Grand Forks, N. Dak., May 9-10, 1973.)*

A method for the production of sulfur-free, low-Btu gas from coal is described along with some preliminary test results. The system, known as MORGAS (Morgantown gas), incorporates pressure gasification in a stirred bed of mine-run coal including lignite, which may have any free-swelling index. Hygrogen sulfide is removed by contacting the hot gas with a bed of solid sorbent containing iron oxide. Elemental sulfur is recovered during regeneration of the sorbent. Gasification of lignite at 40 and 80 lb/sq in. and an hourly rate of 1000 lb using 3220 lb of air and 535 lb of steam yielded 57,800 standard cu ft/hr of moisture-free gas with a heating value of 115 Btu/standard cu ft. Gas production per sq ft of grate area was about 2/3 that obtained with a high-volatile coal.

50693 **APTIC NO. 72996**

McPhee, D. T.

OPERATING EXPERIENCES WITH TWO SO2 REMOVAL SYSTEMS. *Preprint, American Society of Mechanical Engineers, New York, 8p., 1973. (Presented at the American Society of Mechanical Engineers, Air Pollution Control Division, Symposium, Philadelphia, Pa., April 24-25, 1973.)*

Operating experiences with two limestone scrubbing systems for the removal of sulfur dioxide from boiler unit stack gas at thermal power generating facilities are reviewed. Problems associated with one of the systems which was originally planned as a furnace injection setup and then switched to a limestone rear-end system on the inlet side of the scrubbers include: high draft loss through the marble bed because of deposits, deposits in pot drains leading to severe pluggage, demister pluggage, deposit build up in the reaction tank, and severe nozzle wear. Reliabilities of 20-40% availability obtained thus far are unsatisfactory. Operating experience with another facility involving the limestone scrubbing of seven gas streams is too limited to assess.

50694 **APTIC NO. 70361**

Nishiwaki, Mitsuru, and Kenichi Tachikawa

TREATMENT OF POULTRY EXCREMENT BY DEODORIZER AND FERMENTING AGENT SANPAT. *(Dasshu hakkozai sanpatto no keifun ni taisuru koka shiken). Text in Japanese. Tokyo Nogyo Daigaku Nojo Hokoku (Bull. Univ. Farm, Tokyo Univ. Agr.), no. 1, p. 47-52, Dec. 1973. 5 refs.*

Sanpat, which consisted of yeast, enzyme, other fermenting agents, and silicate, was used for the deodorization and drying of soft poultry excrement discharged from the rainy season to mid-summer. The poultry house was divided into three areas, and 1260 and 2100 g of Sanpat were spread in two areas 2 and 3. The amounts of Sanpat were equavalent to 3% and 5% of total excrement from 48 female Leghorns in 7 days. The mixtures were transfered to a house convered with vinyl cloth, and the moisture contents were determined. Moisture content decreased as the amount of Sanpat increased, and there was no apparent humidity or temperature effect on the dehydration. Maggots were not found in the treated areas. The odors in these areas were also less unpleanant. The treated excrements were smaller in size and easier to handle as a fertilizer.

50695 **APTIC NO. 72980**

Slack, A. V., T. M. Kelso, and J. L. Crowe

CURRENT UTILITY APPROACHES TO SLUDGE DISPOSAL. *Preprint, Tennessee Valley Authority, Muscle Shoals, Ala., 22p., 1973. (Presented at the Electrical World Conference, Waste Disposal in Utility Environmental Systems: The Problem Beyond Removal, Chicago, Ill., Oct. 30-31, 1973.)*

Current utility approaches to the disposal of limestone scrubbing sludge are reviewed. Disposal methods that are being incorporated into the design of full-scale facilities include: discharge directly from the scrubber to a settling pond and recycle of clarified liquor, the use of a thickener to concentrate solids prior to transport to a storgae pond, the use of filters or centrifuges for more efficient dewatering, and treatment of dewatered sludge to produce a relatively stable landfill material. Sludge fixation promises to reduce many of the objectionable aspects of disposal, assuming that the processing costs are not higher than alternative methods. (Author summary modified)

50696 **APTIC NO. 70207**

Stumpp, Gerhard

REDUCTION OF EXHAUST EMISSIONS OF DIESEL ENGINES BY MEANS OF THE INJECTION EQUIPMENT. *American Society of Mechanical Engineers, New York, Inst. Congr. Combust. Engines, 10th, Proc., Washington, D. C., 1973, p. 441-456. 1 ref. (April 5-9.)*

In an effort to reduce the emission of nitrogen oxides, hydrocarbons, carbon monoxide, and solid particulates, the influence of varying the time of fuel injection, pressure, and rate on injection is discussed. The time of injection and rate of injection were optimized on engines with open combustion chamber, swirl, or I.D.I. chamber engines and were related to natural aspirated, turbocharged, and intercooled engines. The fuel injection system is a means for reducing the nitrogen oxide emissions through retarding the beginning of injection. This results in an increase of fuel consumption with higher exhaust temperatures. With turbocharged engines, an intercooler can be employed to reduce the NOx emissions without an increase in fuel consumption. The use of small sac volume nozzles proportionately reduces the HC emissions. Secondary injections, when they appear, increase HC and solid particulate emissions. They are to be avoided by all means. By retarding the beginning of injection on open chamber type engines, the solid particulate emissions increase. They can be reduced by increasing injection pressures. Open chamber engines require a much more precise timing for the start of injection, and also create higher load stresses for the pump than engines with an indirect type of combustion system. (Author summary)

50697 **APTIC NO. 72959**

Olson Labs., Inc., Anaheim, Calif.

EVAPORATIVE EMISSION DEVICE RETROFIT STUDY (FINAL REPORT). *California Air Resources Board Contract ARB-2-1372, Proj. ARB 2-363-18, Rept. ARB-R-2-1372-73-16, 232p., Dec. 1973. 27 refs.*

NTIS: PB-235871

The cost-effectiveness of alternative methods for controlling hydrocarbon vapor losses from the carburetor-fuel tank system of pre-1970 vehicles is examined. Evaporative emissions from such vehicles are estimated to be 101,000 tons for the year 1975. The most cost-effective approach for controlling carburetor fumes involves venting or enclosing all external outlets and directing the vapors to a container (air cleaner housing or carburetor canister. The selected approach for the control of fuel tank vapors consists of enclosing all external vents, providing vents with vapor transfer lines and a vapor separator, replacing the vented filler cap with a pressure-vacuum relief cap, and collecting the vapors in a canister. The cost of such modifications for a light-duty vehicle is estimated to range between $103 and $151.

50698 **APTIC NO. 73133**

Southern Research Inst., Birmingham, Ala.

THEORETICAL AND PRACTICAL ASPECTS OF ELECTROSTATIC PRECIPITATION (SECOND QUARTERLY REPORT). *Tennessee Valley Authority Research Agreement TV36921A, Proj. 2932-VI, Rept. 6, SORI-EAS-73-017, 34p., Jan 15, 1973. 5 refs.*

Field studies involving the use of ammonia vapor to condition flue gas for electrostatic precipitation of fly ash were performed at two Tennessee Valley Authority coal-fired steam plants. The data from both plants, one using low-sulfur coal and the other high-sulfur coal indicated that the mechanism of conditioning was the same at each location. The mechanism consists of a chemical combination of the injected NH3 vapor with the naturally occurring sulfuric acid vapor in the flue gases to produce small particles of ammonium sulfate. These small particles are charged in the precipitator, resulting in the enhancement of the space charge, the associated electric field, and ultimately the collection efficiency. The electrical resistivity of the fly ash was unchanged by the addition of NH3 vapor. (Author abstract modified)

50699 **APTIC NO. 73134**

Southern Research Inst., Birmingham, Ala.

THEORETICAL AND PRACTICAL ASPECTS OF ELECTROSTATIC PRECIPITATION (THIRD QUARTERLY REPORT). *Tennessee Valley Authority Research Agreement TV36921A, Proj. 2932, Rept. 9, SORI-EAS-73-145, 59p., April 26, 1973. 8 refs.*

Field studies at Tennessee Valley Authority steam plants were conducted to determine factors responsible for corona-electrode failure in electrostatic precipitators and to investigate the use of ammonia conditioning as a means for improving fly ash collection efficiency. The main causes of corona-electrode failure were electrical arcing and corrosion. Ammonia conditioning was an effective means for increasing fly ash collection efficiency, both in high-sulfur and low-sulfur coal-burning plants. A space charge effect appeared to be mainly responsible for the action of NH3. The conditioner did not change the resistivity of the collected fly ash.

1972

50700 **APTIC NO. 70848**

Hollinden, Gerald A.

LARGE SOURCE CONTROL TECHNOLOGY FOR SO2 EMISSIONS. *24p., 1972. 3 refs. (Presented at the Symposium on How to Comply with the New Federal Sulfur Dioxide Regulations, Indianapolis, Ind., May 12, 1972.)*

Four flue gas desulfurization processes are presented for use in control of sulfur dioxide emissions from power plants. These are dry limestone injection, wet lime/limestone scrubbing, magnesium oxide scrubbing, and catalytic oxidation. The dry limestone injection process appears to be inherently limited in its ability to remove SO2 to any reasonable level. This alone prevents the dry process from playing an important role in contolling SO2 emissions from power plants. The wet lime/limestone processes are currently being favored by the electric power industry as the best solution to the SO2 problem for the near term. The magnesium scrubbing and catalytic oxidation processes both recovery systems, are plagued with the problem of marketing sulfuric acid. The short-term marked outlook for the acid is poor and may continue that way for years to come. It is unlikely that any of these processes is the ultimate answer to SO2 control. Additional processes are needed that have more application and control flexibility, better SO2 removal capability, and better economics. Better throwaway methods are in need of development. The double-alkali process and use of organic acids may meet this need. For recovery processes, they should preferably yield elemental sulfur as a product. One such method is the ammonia scrubbing-bisulfate process which will be tested on a 1-MW pilot plant scale.

50701 **APTIC NO. 72957**

Waggoner, Donald R.

WIDOWS CREEK PROJECT FOR SULFUR DIOXIDE REMOVAL: SOURCES AND COST OF LIMESTONE SUPPLY. *National Fertilizer Development Center, Muscle Shoals, Ala., Tennessee Valley Authority Contract, Rept. S-464, 27p., March 15, 1972. 1 ref.*

Possible sources of limestone and the economics of supply are evaluated for a Tennessee Valley Authority limestone scrubbing project at the Widows Creek Steam Plant. Limestone in the area near Widows Creek appears to be the most economical source; extensive reserves are available. The following chemical specifications seem to be feasible: calcium carbonate, 91% minimum; calcium oxide, 51% miminum; and silica, 6% maximum. Total cost of raw material, handling, and wet grinding for limestone from a nearby supply is estimated to be about $3.00/ton. The proposed use of a wet grinding unit rather than a dry grinding type at Widows Creek is expected to allow for easier dust emission control.

1971

50702 **APTIC NO. 72976**

Gibney, R. L.

TEST AND EVALUATION OF THE AMERICAN POLLUTION CONTROLLED, INC. EXHAUST EMISSION CONTROL DEVICE (FINAL REPORT). *Northrop Corp., Anaheim, Calif., Electro-Mechanical Div. and Olson Labs. Inc., Anaheim, Calif., California Air Resources Board Contract ARB-1902, Proj. ARB-2-131-1, Rept. ARB-R-1902-71-22, NOR71-Y-139, 56p., July 2, 1971.*

NTIS: PB 236386

Exhaust emission and vehicle driveability tests were performed on 50 uncontrolled, pre-1966 cars equipped with an American Pollution Controlled, Incorporated exhaust emission control system comprising exhaust gas recirculation and carburetor modification. Average hydrocarbons and nitrogen oxides were reduced by 36 and 56.3%, respectively. Carbon monoxide increased by 0.5% with the control device installed. The emission improvements represented a 48% reduction in the number of reactive tons of exhaust pollutants emitted from these uncontrolled vehicles. Major vehicle performance problems reported by owners included difficult cold starting, rough idle, surge, hesitation, loss of power, and lower gas mileage; less degradation was reported by professional test drivers. The average cost of installation at Class A garages was $20.66 for labor and $0.66 for parts.

1970

50703 **APTIC NO. 73148**

Sacks, M. E.

CHAR OIL ENERGY DEVELOPMENT - THE DESULFURIZATION OF COED CHAR - PART III (INTERIM REPORT). *FMC Corp., Princeton, N. J., Chemical Research and Development Center, Office of Coal Research Contract 14-01-0001-498, COED Proj. BO55, PCR 807, Rept. OCR-56-Int-2, 152p., Oct. 29, 1970. 24 refs.*

NTIS: PB 234167

A process for desulfurizing char produced in the COED process (conversion of coal to oil, gas, and char) is proposed based on development-scale investigations. The sulfur content of COED char was reduced from 3 to 1 wt% by reaction with hydrogen at 1600 F in the presence of admixed calcined dolomitic limestone. The reaction is controlled by the diffusion of hydrogen sulfide out of the char and into the calcined dolomite. Sulfided dolomite is then separated from the desulfurized char and regenerated. Regeneration is accomplished by reacting a water slurry of sulfided dolomite with carbon dioxide. By-product H2S is converted to sulfur. Regenerated dolomite powder is extruded, dried, calcined, and recycled. Preliminary economics show a plant-level, before-tax return on investment of 20%, assuming a $1.84/ton premium is charged for the desulfurized char. (Author abstract modified)

MEASUREMENT METHODS

1975

50704 **APTIC NO. 70996**

Cutten, D. R., F. R. Dale, P. Crosby, B. W. Koerber, and D. T. Lloyd

A VISIBILITY METER FOR MONITORING ATMOSPHERIC AEROSOL PARAMETERS. *Atmos. Environ., 9(2):253-260, Feb. 1975. 16 refs.*

A compact visibility meter for routine monitoring of atmospheric aerosol parameters is described. The meter operates on a principle similar to that of the integrating nephelometer and is capable of measuring visibilities between 5 km (highly polluted urban aerosols) and 335 km (pure air) with an absolute accuracy of better than 15%. The atmospheric aerosol is sampled by circulating air through the unit using a small fan. Air inlet vents are situated away from the light trap to minimize dust particles from being deposited on the cone. The fan unit is designed to change the aerosol sample in the instrument in approximately 1 minute. Heated air from the lamp compartment is prevented from entering the sampling section by the provision of an air-tight seal between the lamp compartment and the section where the atmospheric aerosol is sampled and by the provision of an exhaust fan and vents in the lamp compartment. The light source is a 50 watt tungsten filament lamp with an internal ellipsoidal mirror to concentrate the light flux. A compact light beam is produced with a collimating lens, and the light beam passes through a series of apertures to reduce stray light in the unit. The beam is finally absorbed in a light trap at the end of the unit. Calibration is performed using standard gases for which the theoretical visibilities are calculated.

50705 **APTIC NO. 70798**

De Souza, T. L. C., D. C. Lane, and S. P. Bhatia

ANALYSIS OF SULFUR-CONTAINING GASES BY GAS-SOLID CHROMATOGRAPHY ON A SPECIALLY TREATED PORAPAK QS COLUMN PACKING. *Anal. Chem., 47(3):543-545, March 1975. 8 refs.*

A gas-solid chromatographic method for the analysis of gases containing sulfur compounds in the parts per million range is described. The analytical system basically consists of a dual column gas chromatograph, a flame photometric detector, and a specially chromatograph, a flame photometric detector, and a specially treated Porapak column. The column is an acetone-washed Teflon tube (1/8 in. outside diameter and 18 in. long) packed with 80/100 mesh acetone-washed Porapak QS. A 2-cu cm stainless steel sampling valve, connected to a vacuum and a mercury manometer, is used to introduce the sample into the column at a constant absolute pressure of 20 cm mercury. Retention times for a standard sample containing hydrogen sulfide, carbonyl sulfide, sulfur dioxide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide are 77, 108, 182, 213, 270, and 361 sec, respectively. Conditioning of the column with two or three injections of concentrated gas mixtures, followed by temperature programming to 240 C, helps to stabilize the column. Retention data are very consistent since there is no liquid phase lost via continual bleeding. The method is inexpensive and offers high resolution in comparison with other chromatographic methods used for the analysis of mixtures of sulfur compounds.

50706 **APTIC NO. 70751**

Fujimura, Mitsuru and Yoshikazu Hashimoto

ANALYSIS OF SIZE DISTRIBUTION DATA OF PARTICULATE MATTER BY AN ANDERSEN SAMPLER. *(Andasen sampura ni yoru earozoru no ryudo bynpu no kaiseki). Text in Japanese. Bunseki Kagaku (Japan Analyst), 24(1):36-41, Jan. 1975. 6 refs.*

A method for analyzing the size distribution of particulate matter collected with an Andersen sampler is described. A cumulative distribution curve is drawn on semi-logarithmic graph paper, using cumulative weight percentages. A frequency distribution curve is then obtained by differentiating the cumulative distribution curve with respect to the log of the distribution. The frequency distribution curve obtained can be treated quantitatively to obtain the size distribution spectrum of the aerosol. Application of the size distribution curve to an aerosol sample analyzed by atomic absorption spectrometry resulted in a peak for iron around 4 micron and a peak for zinc around 0.9 micron.

50707 **APTIC NO. 72954**

Grant, W. B. and R. D. Hake, Jr.

CALIBRATED REMOTE MEASUREMENTS OF SO2 AND O3 USING ATMOSPHERIC BACKSCATTER. *Preprint, Stanford Research Inst., Menlo Park, Calif., 18p., Feb. 1975. 14 refs.*

Remote measurements of calibrated samples of sulfur dioxide and ozone were performed with a differential absorption lidar technique, using ultraviolet signals produced by a tunable dye laser and a nonlinear crystal. The operating wavelengths for these measurements were 292.3 nm and 293.3 nm for SO2 and 292.3 nm and 294.0 nm for O3. The atmosphere in front of and behind the sample chamber acted as a distributed reflector to send laser light back through the chamber to a receiver near the laser. The laser measurements agreed well with in situ measurements. Integration of eight laser pulses at each of two wavelengths allowed the determination of SO2 concentrations with an uncertainty equivalent to + or - 0.6 ppm in 100 m for low concentrations. The corresponding uncertainty limit for O3 was + or - 3.0 ppm in 100 m. The measurement errors were primarily attributable to variations in atmospheric backscattering intensity during the experiment since the different wavelengths were radiated sequentially rather than simultaneously. The sensitivity of a system transmitting two wavelengths at intervals separated by less than 1 min is an estimated + or - 0.1 ppm in 100 m for SO2 and + or - 0.3 ppm for O3. (Author abstract modified)

50708 **APTIC NO. 70626**

Ichinose, Masaomi

AUTOMATIC GAS SAMPLER. *(Jido gasu saishu sochi). Text in Japanese. (Gifu Aichi Electric Co., Ltd. (Japan)) Japan. Pat. Sho 50-2114. 5p., Jan. 23, 1975. (Appl. Jan. 22, 1969, 1 claim).*

An automatic gas sampler consists of a sampling bottle with an impinger, control valve, surge tank, flowmeter (bypassed during sampling), surge tank, flow control valve, and suction pump connected in series. The control valve is operated by a cam placed on a shaft connected to a clock mechanism which rotates with the clock movement. Six sampling bottles are connected individually to six control valves operated by six cams placed in a staggered manner. The cam may be set to open the control valve for 1 or 2 hr while the gas sample is drawn steadily through the solution in the sampling bottle by the action of the suction pump with a battery-operated motor. For gaseous samples, the sampling bag is connected to the control valve in the place of the sampling bottle, and the pipe between suction pump and flow control valve is switched to gas outlet of the suction pump from the gas inlet. The gaseous sample is drawn from the gas inlet of the suction pump and led through the system to the sampling bag. In this case, the sample gas flow in the above-mentioned system is reversed, compared to the case using the sampling bottle.

50709 **APTIC NO. 70389**

Koehler, Albert and Michael Birkle

SCATTERED LIGHT PHOTOMETRY AND GRAVIMETRIC COMPARATIVE MEASUREMENTS OF THE ATMOSPHERIC DUST CONTENT. *(Streulichtphotometrische und gravimetrische Vergleichsmessungen des atmosphaerischen Staubgehalts). Text in German. Staub, Reinhaltung Luft, 35(1):1-4, Jan. 1975. 12 refs.*

Monitors for measurement of total suspended particulate matter in ambient air were operated under field conditions. The methods were photometry of light scattered by the particles, collection of the particles on a filter with a determination of the weight per unit area by beta ray absorption, and measurement of the change of ionization current caused by deposition of ions on the particles. The results of the measurements were compared with the results from a High-Volume sampler and the influences of different sampling arrangements on the results were investigated. The photometric method and the beta-radiation-method yielded results of comparable quality with regard to the gravimetric measurement with the High-Volume sampler. The measurements were taken with dusts occurring in Mannheim, Federal Republic of Germany. Since the size distribution and the optical properties of these dusts did not differ much from dusts found in other industrial areas, generalization of these results seems justified.

50710 **APTIC NO. 70388**

Masek, Vaclav

HARD COAL PETROGRAPHY AND MICROSCOPIC INTEGRATION ANALYSIS FOR DUST EXAMINATIONS IN A COKING PLANT AND ITS VICINITY. *(Steinkohlenpetrographie und mikroskopische Integrationsanalyse im Dienste der Staubdiagnostik in einer Kokerei und in deren Umgebung). Text in German. Staub, Reinhaltung Luft, 35(1):9-11, Jan. 1975. 1 ref.*

Microscope investigations were carried out on samples of sedimented dust and flue dust taken in a foundry coke-oven plant and its immediate surroundings during a 6-month period. Particles with ground sections prepared with polystyrene resin were used for the investigation. The sedimented dust can be characterized by the well known method of investigation based on coal petrography. In contrast to this, the samples of flue dust, and particularly their respirable portion, can in most cases be separated into material groups and determined by integration analysis only after thermal treatment of the charge coal.

50711 **APTIC NO. 70761**

Oda, Shohei, Hideho Kubo, and Hitoshi Kamada

SPARK SOURCE MASS SPECTROGRAPHIC DETERMINATION OF TRACE ELEMENTS IN AIRBORNE PARTICULATES COLLECTED ON A SILVER METAL MEMBRANE FILTER. *(Supaku gen shitsuryo bunsekiho ni yoru menburan furuta joni hoshu shita taiki fuyu funjin chuno biryo genso no bunseki). Text in Japanese. Bunseki Kagaku (Japan Analyst), 24(1):66-68, Jan. 1975. 5 refs.*

A radio-frequency spark source mass spectrographic technique for the analysis of trace elements in airborne particulates is described. Airborne particulates are collected on a silver metal membrane filter (0.8 micron pore size, 47 mm in diameter) by using a low-volume air sampler with an air-flow rate of 15 l/min for 24 or 48 hr. The sample filter is then cut in halves, and a pair of electrodes (about 2 mm by 1 mm by 13 mm) are prepared by compressing each filter half in a moding devise at about 100 kg/sq cm. The sample eledctrodes are then analyzed with a radio- frequency spark source mass spectrograph. Coefficient of variation for quadruplicate runs is about 25%. Comparisons between analytical results obtained by this method versus X-ray fluorescence for the elements magnesium, aluminum, silicon, sulfur, phosphorus, calcium, titanium, vanadium, chronium, manganese, iron, nickel, cobalt, copper, zinc, arsenic, cadmium, and lead show good agreement for all elements except copper.

50712 **APTIC NO. 70324**

Sem, Gilmore J. and John A. Borgos

AN EXPERIMENTAL INVESTIGATION OF THE EXPONENTIAL ATTENTUATION OF BETA RADIATION FOR DUST MEASUREMENT. *Staub, Reinhaltung Luft, 35(1):5-9, Jan. 1975. 20 refs.*

The attenuation of beta radiation as it passes through a collected deposit of dust particles is now used to measure the mass concentration of airborne dust. Previous investigators assumed that a single exponential function describes the attenuation I/I sub o of beta radiation passing through the deposit. The nonexponential character of the beta radiation attenuation was experimentally investigated for a specific source-substrate- detector geometry. For two beta sources, carbon (14) and promethium (147), the data and a quasi-theoretical analysis indicate that I/I sub o is not a simple exponential function of particulate thickness density (mg/sq cm), and as a result, a different calibration curve exists for every initial radiation intensity I sub o. For the sensor geometry tested, these effects cause measurement errors well in excess of 10% if the commonly accepted exponential calibration is assumed. Variations of the sensor geometry may strongly influence the relationship of attenuation to particulate density. (Author summary)

50713 **APTIC NO. 70689**

Smith, Dwight M., John J. Griffin, and Edward D. Goldberg

SPECTROMETRIC METHOD FOR THE QUANTITATIVE DETERMINATION OF ELEMENTAL CARBON. *Anal. Chem., 47(2):233-238, Feb. 1975. 31 refs.*

A spectrometric method for the quantitative determination of elemental carbon was developed and applied to fly ash samples from several power plants. Duplicate results of some of the analyses are listed for materials having a range of carbon content from 0.6 to 10% by weight. The duplicate analyses were based upon different samples of the same isolate, thus indicating only the reproducibility of the method. Because of the refractory nature of these samples, a somewhat longer grinding time was used. The effect of grinding time upon the analysis was examined for several samples. There is a satisfactory reproducibility of the method in application to such materials. No independent carbon analyses of the fly ash samples were available. The spectrometric method can also be used to measure carbon in materials with and without organic content such as synthetic sediments and marine sediments.

1974

50714 **APTIC NO. 68897**

Baumgardner, R. E., T. A. Clark, J. A. Hodgeson, and R. K. Stevens

DETERMINATION OF AN OZONE INTERFERENCE IN THE CONTINUOUS SALTZMAN NO2 PROCEDURE. *Preprint, 40p., 1974 (?) 19 refs.*

The continuous Saltzman nitrogen dioxide procedures were studied to determine whether an ozone interference exists, and to quantify the effect if present. Generation of dynamic mixtures of NO2 and O3 required in the interference tests necessitated the examination of the O3-NO2 gas phase reaction. Newly developed chemiluminescent analyzers for O3 and NO2 were used to monitor the O3-NO2 stream. There was a negative interference in both the continuous Saltzman and modified Saltzman procedures which was dependent on the absolute O3 and NO2 concentrations. The reaction of NO2 and O3 is the sample stream does not account for the decrease in NO2 response as observed by the Saltzman procedures. Ozone and NO2 data from four cities were compared and show that O3 to NO2 ratios exist in the atmosphere. Ratios higher than 1 pose a significant problem in using the continuous Saltzman or modified procedure for ambient air monitoring. (Author abstract modified)

50715 **APTIC NO. 70534**

Beeck, J. Op de and J. Hoste

SOME MODERN APPLICATIONS OF ACTIVATION ANALYSIS. *Analyst (London), vol. 99:973-993, Dec. 1974. 68 refs.*

Applications of neutron-activation analysis have considerably increased in importance since the advent of high-resolution germanium (lithium) detectors. Complex spectra can be analyzed without the need for lengthy chemical separations. An area that has been increasingly used is the determination of the inorganic composition of aerosols. By varying the different parameters, such as irradiation time, decay time, thermal or epithermal neutron activation, over 40 elements have been quantitatively determined, down to the nanogram level. Comparative inter- laboratory tests on standards showed that neutron activation was superior regarding sensitivity and accuracy of results compared with other instrumental methods. Neutron activation has also been a powerful aid in arachaeology, especially in the determination of potsherds. Considerable progress was also achieved in activation analysis with 14 MeV neutrons, in which the most important application is oxygen determination either as a major constituent, for instance in rocks, or as a trace element in metals. Development of relatively inexpensive isotopic neutron sources such as californium-252 and actinium-227-beryllium has increased the interest in the determination of major constituents. The advantages offered for a number of elements such as fluorine, manganese, aluminum, silicon, and silver are either due to high speed and/or to precision of the analysis compared with other instrumental methods. (Author abstract modified)

50716 **APTIC NO. 72981**

Byer, R. L.

INFRARED DIFFERENTIAL ABSORPTION FOR ATMOSPHERIC POLLUTANT DETECTION (SEMI-ANNUAL REPORT). *Stanford Univ., Stanford, Calif., Microwave Lab., National Aeronautics and Space Administration Contract NSG-1012, Rept. 2357, 105p., Oct. 1974. 156 refs.*

NTIS: N74-33949

Progress in the development of tunable infrared lasers and their application to remote air pollutant detection is presented. A high gain, angle tuned, singly resonant lithium niobium oxide parametric oscillator pumped directly at 1.06 micron by a Q-stitched laser was successfully operated over the 1.4-4.4 micron range. Output energies of greater than 1 microJoule/pulse at 5 pulses/sec were observed with a 15% energy conversion efficiency. A comparison of various remote detection methods indicated that absorption type methods offer the most sensitivity at the least required transmitted energy. Topographical absorption provides the advantage of a single ended measurement, and differential absorption offers the additional advantage of a fully depth resolved absorption measurement. Recent experimental results confirming the range and sensitivity of the methods are presented for such atmospheric species as water vapor, methane, hydrogen sulfide, carbon monoxide, nitric oxide, sulfur dioxide, carbon dioxide, and nitrogen dioxide. (Author abstract modified)

50717 **APTIC NO. 73043**

Carter, William Jackson, III

QUANTITATIVE X-RAY PHOTOELECTRON SPECTROSCOPY AND APPLICATIONS TO AIR POLLUTION. *Tennessee Univ., Knoxville, Physics Div., Thesis (Ph.D.), Sept. 1974. 137p. 72 refs.*

NTIS: ORNL-TM-4669

The technique of electron spectroscopy for chemical analysis (ESCA) was evaluated for analyzing air pollution samples of particulate matter. Three particulate air pollution samples and the filter paper on which they were collected were studied using aluminum potassium alpha excitation. The elements comprising the major composition of each sample were identified from the binding energy position of the peaks arising from the photoionization of core electrons. Different chemical states or environments for certain elements were also observed. The composition for one of the particulate matter samples was examined in detail in order to obtain qualitative and quantitative identification of the elements present. X-ray photoelectron spectroscopy (XPS) is potentially applicable for routine analysis of these type samples. The sample was also examined by Auger electron spectroscopy (AES) and was in agreement with the XPS data for lead and sulfur. (Author abstract modified)

50718 **APTIC NO. 73009**

Chaby, Ilan

RAPID MEASUREMENT OF DROPLET SIZE DISTRIBUTIONS BY OPTICAL HETERODYNE SPECTROSCOPY. *Nat. Bur. Stand. U. S. Spec. Publ., no. 412:65-72, Oct. 1974. 2 refs. (Presented at the National Bureau of Standards Seminar on Aerosol Measurements, Gaithersburg, Md., May 7, 1974.)*

An optical heterodyne spectrometer for the direct determination of particle size between 0.5 and 50 micron radius is described. The particles fall through a laser beam which passes horizontally across a chamber containing the particles. The light scattered by the particles is observed at a small forward angle in the vertical plane, and the frequency of the light scattered is Doppler shifted from the frequency of the incident light. The magnitude of the Doppler shift gives the instantaneous vertical velocity of the particles, and these velocities can then be related to the particle sizes by using the Stokes relation. Thus, the radii of the droplets passing through the beam is given by the Doppler shift frequencies, without regard to intensity. The technique is successfully applied to the measurement of parameters associated with cloud droplet growth (from 1-10 micron particle radius) in a diffusion cloud chamber and can also be extended to the analysis of nonspherical particles by more complex calculation of the falling velocity as a function of size parameters and by the calculation of the Mie scattering intensities for more complex geometries.

50719 **APTIC NO. 70535**

Cooper, Hal B., Jr., Gary D. Rawlings, and Robert S. Foote

MEASUREMENT OF MERCURY VAPOR CONCENTRATIONS IN URBAN ATMOSPHERES. *ISA (Instr. Soc. Am.) Trans., 13(4):296-302, 1974. 17 refs. (Presented at the Instrumentation Society of America Conference and Exhibit, Annual, 28th, Houston, Tex., Oct. 15-18, 1973.)*

Ambient mercury concentrations in urban atmospheres in Dallas, Texas, were determined by collection of the vapor by amalgam formation on a gold screen for individual samples. Mercury vapor was released from the amalgam by heating of the gold screen, followed by analysis with a flameless ultraviolet double beam atomic absorption spectrophotometer. The technique was also suitable for source gas emission measurements by means of appropriate dilution and cooling with air. Ambient mercury vapor concentrations at a location adjacent to a freeway correlated with traffic volume. Ambient mercury vapor levels varied between 4 and 40 nanograms/cu m. Rainfall near an airport removed mercury from the upper air at a peak traffic period and reemitted it at the ground level during periods of intense rainfall activity. Elevated mercury vapor levels were observed near nonferrous metal smelters, a Kraft pulp mill, and a chlor-alkali plant. Ambient mercury levels at locations along a ship channel varied between 4.07 and 9.15 ng/cu m, except at two locations downwind of a specific point source. Mercury vapor concentrations downwind from the chlor-alkali plant were 20.75 and 26.60 ng/cu m. Mercury concentrations downwind from a complex of two Kraft pulp mills and downwind from a copper smelter were 40 and 30 ng/cu m, respectively. (Author abstract modified)

50720 **APTIC NO. 70799**

Cormack, Douglas, Thomas A. Dorling, and Bernard W. J. Lynch

COMPARISON OF TECHNIQUES FOR ORGANOLEPTIC ODOUR-INTENSITY ASSESSMENT. *Chem. Ind. (London), no. 21:857-861, Nov. 2, 1974. 10 refs.*

A dynamic dilution odor assessment technique was compared with the American Society for Testing and Materials syringe method during laboratory and field evaluations. The dynamic dilution apparatus was entirely constructed of Teflon and Teflon-coated mild steel. Initial and secondary sample flows of 2-10 l/min and a maximum dilution rate of 2000 l/min were used. Threshold concentrations obtained with the dynamic dilution method for butyric acid, dimethylsulfide, diethylamine, and acrolein were nearly identical with those obtained in odor room assessments, while the ASTM thresholds were in all cases higher than those of the odor room by 1-4 orders of magnitude. Dilution factors obtained from a feathermeal dryer during field tests ranged from 10,000-100,000 for the dynamic dilution method with a Tedlar bag system as compared to ASTM syringe dilution factors of 4-70, indicating serious odor losses with the latter method.

50721 **APTIC NO. 71048**

Creighton, David M.

FLUID MONITORING SYSTEM AND FLUID SAMPLING METHOD AND APPARATUS FOR USE THEREWITH. *(International Telephone and Telegraph Corp., New York) U. S. Pat. 3,819,330. 10p., June 25, 1974. 8 refs. (Appl. Feb. 7, 1972, 13 claims).*

A method for sampling and/or monitoring hydrogen sulfide and sulfur dioxide in flue gases is described in which delivery and dilution is performed automatically and immediately after the sample is taken, thus avoiding clogging problems associated with prior- art sampling conduits. The sampling probe has an air supply to pick up the sample, and an air-sample mixer is provided between the probe and a titrator. Continual sampling is performed with a pulse oscillator which repeatedly energizes a probe solenoid. Repeated pressure indications occur when the probe pick up is in the sample pick up position. The probe pick up cavity is repeatedly purged immediately after each sample is taken to keep the cavity clean. The probe includes an inner hollow teflon cylinder which is in pressure contact with an outer concentric stainless steel cylinder and which has axial grooves to provide fluid-tight passageways or conduits. The teflon is kept in axial compression to keep the grooves fluid tight. (Author abstract modified)

50722 **APTIC NO. 73111**

Davies, R. and J. D. Stockham

A REVIEW OF THE METHODS FOR THE PARTICLE SIZE ANALYSIS OF AEROSOL SPRAY CAN DROPLETS. *Nat. Bur. Stand. U. S. Spec. Publ., no. 412:1-12, Oct. 1974. 41 refs. (Presented at the National Bureau of Standards Seminar on Aerosol Measurements, Gaithersburg, Md., May 7, 1974.)*

Methods for sizing aerosol spray can droplets are reviewed. Laser holographic imaging is the most technically attractive, though the method requires a high capital cost ranging between $25,000 to $60,000, depending on the type of image analysis equipment employed. Laser holography is fast, requires no aerosol confinement, and functions independently of the droplet composition. Light scattering methods are the second choice, with the cost being estimated at around $10,000. Light scattering is again fast, but the aerosol must be confined and the signal is dependent on the refractive index of the droplet. Methods such as photographic imaging and impaction can be considered if low capital cost investment is a factor. The camera is the only investment for photographic imaging if sizing is manually performed on the photograph. Sizing can be performed with impactors by reconstruction of the droplet size from the size of the deposit on each stage, providing that the solute concentration is known. Alternatively, sensitized paper can be used as the deposition surface with an impactor of the Lundgren type. Although the capital cost is low (about $1000) for photographic imaging and impaction, the analytical time is long; collection times are fast, however.

50723 **APTIC NO. 73127**

Dee, L. A., H. H. Martens, and J. T. Nakamura

EVALUATION OF SOLID SORBENTS FOR SAMPLING SO2, HCL, AND HF FROM STATIONARY SOURCES (FINAL REPORT). *United States Air Force, Edwards, Calif., Rocket Propulsion Lab., Environmental Protection Agency Proj. EPA 000CX, Rept. AFRPL-TR-74-54, FY 73, 11p., Aug. 1974. 6 refs.*

NTIS, DDC: AD-784813

Various solid sorbents were evaluated for the sampling of sulfur dioxide, hydrogen chloride, hydrogen fluoride, and silicon tetrafluoride from stationary sources. Lead oxide did not absorb HF or SiF4, though it did appear to absorb HCl and SO2 quantitatively; however, the problems associated with extraction and subsequent analysis of the corresponding anions are insurmountable at present. Lithium carbonate is a useful sorbent for HCl and HF, though less complicated carbonate sorbents need to be first evaluated. Manganese dioxide also absorbs SO2, but further efforts are needed to develop a more specific trace sulfate determination method.

50724 **APTIC NO. 70668**

Docherty, A. C.

INDUSTRIAL SAMPLING AND ANALYSIS. *Analyst (London), vol. 99:853-858, Dec. 1974. 6 refs.*

Quality control by sampling and analysis is essential in the chemical industry. Raw materials, process intermediates, and finished products must all be analyzed for conformity with the relevant specifications. With increasing concern for the environment, this control has been extended to effluents. Illustrative examples are given of the methods used for the quality control of compound fertilizers and for the analysis of gaseous and liquid effluents. A study of emissions of nitrogen and sulfur oxides in the Heysham industrial area in England is described. The sources of sulfur dioxide and nitrogen dioxide were separated, and therefore their concentrations varied from each other according to the wind. A weighted average concentration of 380 micrograms/cu m NO2 was experienced for 80.5 hr or 9.3% of the time. A weighted average concentration of 216 micrograms/cu m of SO2 was experienced for 171 hr or 19.8% of the time. Peaks were recorded for NO2 and SO2 simultaneously for only 58 hr or 6.7% of the time; the weighted average concentrations of NO2 and SO2 were 425 and 220 micrograms/cu m, respectively. Thus, although the two pollutants may arise from the same industrial area, it cannot be assumed without detailed investigation that both will be present simultaneously at the same location in significant concentrations. Low-level SO2 emissions from domestic fires may be significant in air quality measurements.

50725 **APTIC NO. 73138**

Doemeny, Lawrence, George Carson, and Bruce Almich

RAPID RESPIRABLE MASS MEASUREMENT. *Nat. Bur. Stand. U. S. Spec. Publ., no. 412:127-136, Oct. 1974. 5 refs. (Presented at the National Bureau of Standards Seminar on Aerosol Measurements, Gaithersburg, Md., May 7, 1974.)*

A respirable dust monitor that utilizes the principle of beta absorption is described. The monitor can evaluate dust concentrations ranging from 0.06-200 micrograms/cu m, with the range being determined by sample time alteration (12 sec to 8 min). The monitor consists of a two-stage collection system. The first stage is a cyclone, and the second stage consists of an inlet nozzle impactor beta absorption assembly and mylar impaction disk. The beta particle source is housed in the impactor nozzle. As material impacts on the mylar disk, radiation is increasingly absorbed, thus decreasing the radiation reaching the Geiger tube beneath the disk. The transmission of beta particles depends almost entirely on the mass off material per unit area of absorber and the maximum beta energy. The sampler is limited to the collection of particulates with aerodynamic diameters less than 50 micron when the cyclone is removed. The principle of beta absorption can also be applied to existing aerosol sampling equipment for rapid size determination by simply positioning a beta source and detector at each stage of separation.

50726 **APTIC NO. 73080**

Donaldson, William T.

PRELIMINARY CHEMICAL ANALYSIS OF AQUEOUS WASTES FROM COAL CONVERSION PLANTS (A RECOMMENDED APPROACH). *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 55-65, Oct. 1974. 5 refs.*

Methods for the preliminary chemical analysis of aqueous wastes from coal conversion plants are recommended. Limited data on wastes indicate the need for using those analytical techniques proven useful with other types of effluents. Solvent extraction gas chromatography-mass spectrometry, with computerized data analysis is recommended for characterization of organic constituents. Multielement techniques, such as spark source mass spectrometry or X-ray fluorescence, are recommended for elemental analyses. Such an approach, when applied to the characterization of wastes from petrochemical plants and Kraft pulp mills, showed the composition of the effluents to be significantly different from that predicted from a knowledge of raw material and manufactured products. (Author abstract modified)

50727 **APTIC NO. 71295**

Dravnieks, Andrew

METHOD OF ANALYZING ODORS. *(IIT Research Inst., Chicago, Ill.) U. S. Pat. 3,815,405. 10p., June 11, 1974. 6 refs. (Appl. Nov. 30, 1972, 7 claims).*

A method for the objective and quantitative determination of one or more subjective odor dimensions is presented. The odorant sample is passed through several gas chromatographic columns having stationary phases of differing chemical polarity. The relative solubilities of the odorant sample with respect to each of the stationary phase materials are then determined by measuring the amount of time-required for the sample to pass through each of the columns. The quantitative numerical value of the subjective dimensions of the odorant sample are then derived by correlating the relative solubilities of several known odorant materials in the same stationary phase materials with subjectively determined quantitative numerical values for those odorant materials. These instrumentally measurable properties can be substituted for the commonly used odorimetry method, which relies on human judgment.

50728 **APTIC NO. 70327**

Dresia, H.

RECORDING RADIOMETRIC DUST MEASURING UNITS FOR STATIONARY AND MOBILE USE. *(Registrierende, radiometrische Staubmessgeraete fuer den stationaeren und mobilen Einsatz). Text in German. Tech. Mitt., 67(11):473-477, 1974. 4 refs. (Presented at the Seminar on Dust Collection in Industrial and Commercial Plants, Haus der Technik, Essen, Germany, May 15, 1974.)*

Radiometric dust analyzers measuring the absorption of beta rays by dust collected on a filter can be used for both emission as well as immission measurements. The filter section exposed to the dust is transported on in certain intervals whose length is determined by the dust concentration. Isokinetic sampling is feasible. For avoidance of measurement errors due to formation of strands or changes of the flow profile a tilting sampling probe periodically brushes across the entire flow cross section (e.g., stack cross section). For mobile use, e.g., at immission measurements, the tiltable probe is replaced by an adjustable probe with the sampling tube made of flexible plastic. With such a sampling device the sampling point can be constantly changed so that grid measurements according to VDI (Verein Deutscher Ingenieure) guideline 2066 can be taken faster than by other methods. Dust immisssion measurements by radiometric analyzers can be easily combined with measurements of the specific activity in aerosols.

50729 **APTIC NO. 70625**

Eckstein, N. A.

CONTINUOUS TOTAL SULPHUR MEASUREMENT AT HARMAC. *Pulp Paper Can., 75(11):95-98, Nov. 1974. 1 ref. (Presented at the Canadian Pulp and Paper Association, Technical Section, Air and Stream Improvement Conference, 8th Annual, St. Andrews, New Brunswick, Sept. 11-13, 1973.)*

The use of a flame photometric sulfur analyzer for continuous monitoring of total gaseous sulfur emissions from a kraft pulp mill s recovery boiler stack is described along with modifications made to control the flow of sulfurous gas to the flame unit. Initially the sulfur analyzer was equipped with a Porostone filter mounted on the end for particulate protection of the sampling line and an air condenser for gross moisture removal. A standard Whatman cellulose particulate thimble and a 5 micron Teflon filter were included in the sampling line. After satisfactory performance for 1.5 days, the instrument developed a partially shorted potentiometer, and the entire sample flow control system was redesigned following replacement potentiometer replacement. Back pressure to force the sample to the flame unit was accomplished by immersing the reject sample line into a bottle of water. A diaphragm type aquarium pump was used to draw the sample. The modified unit has operated continuously for 5 mo satisfactorily. The only major problem encountered was corrosion of the probe after about 6 mo. The inclusion of an ultraviolet absorption cell on the sample line to measure sulfur dioxide and possibly total sulfur, SO2, and total reduced sulfur simultaneously from the same gas sample is under consideration.

50730 **APTIC NO. 70675**

Eddy, David S.

PHYSICAL PRINCIPLES OF THE ZIRCONIA EXHAUST GAS SENSOR. *IEEE (Inst. Elect. Electron. Engrs.) Trans. Veh. Technol., 23(4): 125-128, Nov. 1974. 12 refs. (Presented at the Institute of Electrical and Electronics Engineers Vehicular Technology Conference, 24th, Cleveland, Ohio, Dec. 4-5, 1973.)*

A brief description of the zirconia exhaust gas sensor is given. The electrochemical principles of the sensor are reviewed. Starting from the Nernst equation, theoretical relations are derived which relate the galvanic potential of the sensor to the composition of the exhaust gas from an internal combustion engine. Theoretical curves of galvanic potential versus the inlet air-fuel ratio are shown and discussed. The utility of the zirconia exhaust gas sensor is defined in applications such as closed-loop electronic fuel injection engine control systems. (Author abstract)

50731 **APTIC NO. 70925**

Ensor, David S.

PLUME OPACITY MEASUREMENT. *United States-USSR Working Group, Stationary Source Air Pollution Control Technology, Control Fine-Part. Emiss. Ind. Sources Symp. Proc., San Francisco, Calif., 1974, p. 641-672. 30 refs. (Jan. 15-18, Paper 27.)*

Plume opacity measurement is discussed in terms of aerosol properties and measurement instrumentation. Stack-mounted sensors for plume opacity measurements include transmissometers and integrating nephelometers. The former vary widely in quality and price and many are considered to be qualitative rather than quantitative sensors. The Environmental Protection Agency is developing guidelines for the construction of stack transmissometers which call for standardization of the wavelength response, restriction of detector acceptance angle, and collimation to less than 5 deg. Integrating nephelometers are subject to light losses at the extremes of the integration angular truncation and light attenuation from the sample volume to the detector. Remote methods of plume opacity measurement include passive methods utilizing smoke detection guides, photometers, and contrasting target techniques as well as active methods. The latter are limited by meteorological conditions but are not dependent on ambient lighting. Active methods include the use of external transmissometers, photometry of lights, and lidar techniques.

50732 **APTIC NO. 70586**

Fernandez, C.

A MICRO/MACROTECHNIQUE FOR THE EVALUATION OF IRONFOUNDRY DUST SAMPLES. *Ann. Occupational Hyg., 17(2):97-109, 1974. 21 refs.*

A technique for the assessment of silicosis dust hazard in iron foundry dust is described. Two types of sampling instruments are used: a personal size selecting gravimeter dust sampler and a hexhlet sampler with an adaptor to take a 5.5 cm diameter filter. Gravimetric measurements are performed on a balance, and quartz is determined by infrared spectrophotometry. The procedure is based on the elimination of the filter by dissolution, centrifuging, and successive washes such that total recovery, gravimetric measurements, incineration, and further total recovery, if necessary, can be completed in a single container (a pyrex glass tube). Microsorban is the filter material of choice. The technique allows for the estimation of total respirable dust concentration, incinerated respirable dust concentration, and quartz content as a percent of total respirable dust. Total respirable dust concentration is deduced from the filtered air volume and the weight of the sample, while incinerated respirable dust concentration is calculated from the weight of incombustible dust and the volume of filtered air. The infrared technique is capable of detecting about 1% of quartz in an ashed sample weighing 0.40 mg. Common interferences include iron oxide and aluminum oxide. However, reasonably good agreement between quartz content and analytical results can be obtained by using the transmission measured to the peak of the transmission curve immediately before the quartz 12.5 micron absorption. Application of the method to an iron foundry (150 personal samples and 80 static (hexhlet) samples) indicates that the most hazardous working sites are: sand preparation, sandblasting and grinding, moulding and knocking out, and pouring and loading of blast furnaces.

50733 **APTIC NO. 71174**

Flesh, R. David, James C. Burns, and Amos Turk

AN EVALUATION OF COMMUNITY PROBLEMS CAUSED BY INDUSTRIAL ODORS. *In: Human Responses to Environmental Odors. Amos Turk, James W. Johnston, Jr., and David G. Moulton (eds.), New York, Academic Press, 1974, p. 33-44. 5 refs.*

Field studies involving attitude surveys, sensory techniques, and chemical and instrumental methods for the evaluation of community odor problems are reviewed. Attitude surveys among residents in an affected community are limited by the lack of specialization of the respondents, the strong likelihood of bias, and the length of time required for the survey and data tabulation. Sensory techniques, usually involving threshold dilution methods, appear best suited for quickly establishing whether odors in a community have reached levels likely to cause annoyance. Drawbacks of the method include the difficulty of sensing threshold levels, the transiency of odor concentrations at the particular location, and the lack of direct measures for odor intensity before dilution. A study of seven odor-affected communities in the United States using attitude surveys and scentometers indicated that the probability of encountering odor problems of industrial origin is greatest in the urbanized area of the Appalachian region and the California coastal zone. Scentometers appear to be used most successfully when the odor is of constant intensity. Chemical and instrumental analysis of odorous compounds is limited by the fact that odors are often caused by complex substances composed of many different odorants.

50734 **APTIC NO. 70303**

Fukuchi, T. and M. Oishi

EXAMINATION OF ODORANT SAMPLING METHODS. *(Akushu no sanpuringu- ho ni kansuru ichi kosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):455, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 306.)*

Adsorption of odorant samples on sampling vessels was investigated by using acetone gas samples (2000-4000 ppm; 20 C; moisture content, 50%) and following concentration changes by gas chromatography. Sampling bags under investigation were made of Tedlar, Mylar, Saran, polyethylene, and vinyl chloride. Sampling flasks and bottles were also included in the study. Use of Mylar sampling bags and official gas-sampling bottles resulted in nearly 100% retention of acetone gas samples after 240 hours. On the other hand, nearly 100% adsorption of acetone on polyethylene bags occurred after 240 hours.

50735 **APTIC NO. 73162**

Gravatt, C. C.

LIGHT SCATTERING METHODS FOR THE CHARACTERIZATION OF PARTICULATE MATTER IN REAL TIME. *Nat. Bur. Stand. U. S. Spec. Publ., no. 412:21-32, Oct. 1974. 6 refs. (Presented at the National Bureau of Standards Seminar on Aerosol Measurements, Gaithersburg, Md., May 7, 1974.)*

The development of light scattering methods for the characterization of particulate matter is reviewed, with particular emphasis on an instrument for real-time particle size distribution measurements and a smoke detector that allows for some degree of chemical characterization of particles. Real-time airborne particulate size measurements can be made with a forward lobe light scattering method that involves the simultaneous measurement of the intensity of light scattered by a single particle at two small scattering angles. The ratio of the two intensities is a direct measure of particle size and is fairly independent of the particle s refractive index. The sizing error of the method, as calculated from numerical solutions of Mie equations for spheres, is not greater than + or - 15% for particles sizes of from 0.2-4 micron and for essentially all possible refractive indices. The method can be extended to size determinations down to 0.05 micron by the measurement of a single forward lobe intensity. A smoke detector capable of distinguishing between fire-produced and nonfire-produced aerosols monitors light scattered over two regions. One region is over the angular range of 40-70 deg in the plane of polarization, with the amount of light scattered being relatively large for nonabsorbing aerosols and less for aerosols containing absorbing materials. The second region, perpendicular to the polarization plane and over the angular range of 80-100 deg, is approximately proportional to the total number of particles in the beam, regardless of whether or not they are absorbing. (Author abstract modified)

50736 **APTIC NO. 70196**

Hamilton, P. M. and K. W. James

CORRELATION SPECTROSCOPY AND LONG RANGE DRIFT OF SO2. *Inst. of Electronic and Radio Engineers, London (England), Proc. Conf. Environ. Sensors Appl., London, England, 1974, p. 1-10. 2 refs. (Nov. 18-19.)*

The use of correlation spectroscopy in the measurement of the long range drift of sulfur dioxide is discussed. It is necessary to know the deposition velocities for SO2 over land and sea to predict the depletion of SO2 as it travels from its source. The Barringer correlation spectrometer was used to measure depletion of SO2. The absolute accuracies required for measurement of depletion and deposition velocities are difficult to achieve. Computer simulation of the correlation process may provide sufficient information to suggest improved techniques to reduce the fluctuation in the background offset, possibly by some changes in the instrument. (Author conclusions modified)

50737 **APTIC NO. 70306**

Hasegawa, T., T. Ishiguro, Y. Shigeta, H. Nagai, S. Kagotani, H. Kitamura, and M. Seki

GAS CHROMATOGRAPHIC ANALYSIS OF ALIPHATIC AMINES IN AMBIENT AIR. *(Taikichu amin-rui no sokutei hoho ni kansuru kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):458, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 309.)*

Low carbon aliphatic amines in the atmosphere were analyzed by trapping them in a sulfuric acid solution or on oxalic acid-impregnated glass fiber filter paper, treating with potassium hydroxide, then nitrogen gas, and passing the recovered amines through a gas chromatography column after low temperature concentration. Standard solutions of trimethylamine and dimethylamine were used to check consistency of results. Nearly 100% recovery of the amines was effected, with 10% reproducibility.

50738 **APTIC NO. 70676**

Hertzendorf, M. S.

CONVERSION OF AIR POLLUTION UNITS. *Pollut. Eng., 6(12):34-35, Dec. 1974.*

In air pollution engineering, concentrations of atmospheric gaseous pollutants are usually presented either as a volumetric ratio (ppm of air), or on a gravimetric basis (weight of pollutant per unit volume as mg/cu m or micrograms/cu m). Since it is desirable to convert one to another easily, a simple method for conversion and a conversion chart nomograph were developed.

50739 **APTIC NO. 70580**

Hoshika, Yasuyuki, Ichiro Kojima, Kazumi Koike, and Kenji Yoshimoto

GAS CHROMATOGRAPHIC ANALYSIS OF THE TRACE COMPONENTS IN DIMETHYL SULFIDE (DMS), AND DIMETHYL DISULFIDE (DMDS). *(Jimechiru sarufide (DMS) oyobi jimechiru jisarufide (DMDS) no biryo konnyu fujunbutsu no gasu kuromatografu bunseki). Text in Japanese. Kogai (Hokua Shobo) (Pollution Control), 9(5):47-50, Sept. 1974. 3 refs.*

Trace impurities in the commercial analytical grade of dimethyl sulfide (DMS) and dimethyl disulfide (DMDS) were analyzed by gas chromatography using a flame detector. The columns used are 25% Tris (2-cyanoethoxy) propan on shimalite 60/80 mesh, 25% Tri cresyl phosphate on shimalite 60/80 mesh, and 10% Polyphenyl ether on shimalite 60/80 mesh. The standard sample gases were prepared by putting 1 micromilliliter of liquid DMS or DMDS into a 100-cubic centimeter pyrex flask evaporating it. Using a gas-tight syringe, 1 cc of the prepared gaseous sample was injected into the gas chromatograph. The impurities in DMS were 710 ppm of DMDS, 355 ppm of carbon disulfide, and 95 ppm of n-butyl ethyl sulfide and diallyl sulfide. The impurities in DMDS were 190 ppm of methyl mercaptan, ethyl mercaptan, isopropyl mercaptan, and t-butyl mercaptan, and 95 ppm of DMS, diethyl sulfide, and diisodiallyl sulfide. These impurity levels are low enough to allow the commercial analytical reagent to be used as a standard reagent for odor analysis.

50740 **APTIC NO. 70698**

Hosoya, T. and Y. Yamashita

ANALYTICAL METHODS FOR DETERMINATION OF HYDROGEN SELENIDE IN EXHAUST GAS AND EXAMPLE. *(Haigasu-chu no serenka suiso no teiryo bunseki to sono jissoku rei). Text in Japanese. Taiki Osen Kenyu (J. Japan. Soc. Air Pollution), 9(2):435, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 286.)*

Exhaust gas was sampled with two impingers (total volume) 20 l) at 1-2 l/min by the JIS K0095 method. The hydrogen selenide in the exhaust gas was first converted to selenium bromide with bromine followed by hydrolysis to selenous acid. Free bromine in the solution was reduced by hydroxyamine hydrochloride, and the pH was adjusted to about 2 by sodium hydroxide. The solution was diluted with 0.01 N hydrogen chloride to 100 ml. A 2,3-diaminonaphthlene solution (0.1 g in 100 ml 0.1 N HCl) was added, and the resulting selenol compound was extracted with n-hexane. The absorbance near 378 nm was measured, and the concentration was determined by referring to a pre-constructed calibration curve from standard solution. A 5% hydrogen bromide solution saturated with Br2 was the most desirable absorbent for H2Se.

50741 **APTIC NO. 73137**

Hotham, Geoffrey A.

SIZING AEROSOLS IN REAL TIME BY PULSING UV LASER MACHINE. *Nat. Bur. Stand. U. S. Spec. Publ., no. 412:97-126, Oct. 1974. 34 refs. (Presented at the National Bureau of Standards Seminar on Aerosol Measurements, Gaithersburg, Md., May 7, 1974.)*

A system that uses a pulsing ultraviolet laser for the real-time sizing of aerosols is described. The continuously pulsing laser produces spray-drop pictures that are recorded on an instant replay recorder for sizing by a reticule on the monitor face. Size distribution may be obtained in real time by adding an automatic scanner. Particle counts as fas as 10,000 counts/sec can be realized. The size range capability of the system is from 0.3-10,000 micron, with the velocity of measurable particles being stationary to 1000 ft/sec. Virtually any type of aerosol can be measured with the apparatus.

50742 **APTIC NO. 69986**

Hrubesh, Lawrence W.

FEASIBILITY STUDY OF A GUNN-DIODE MICROWAVE CAVITY SPECTROMETER AS A FORMALDEHYDE MONITOR (FINAL REPORT). *California Univ., Livermore, Lawrence Livermore Lab., Environmental Protection Agency Contract IAG-0179 (D), National Aeronautics and Space Administration Contract L75902, Atomic Energy Commission Contract W-7405-Eng-48, 98p., Feb. 1974. 11 refs.*

NTIS: UCID-16488

A prototype of a simplified microwave spectrometer was developed for testing the feasibility of rotational spectrometry as a monitor for specific contaminants in air. The instrument was designed to monitor formaldehyde vapor in air, but is applicable to any other polar, low molecular weight contaminant. A solid state diode source and a high quality cavity absorption cell were used to optimize sensitivity while providing compactability. A molecular separator with two stages of dimethyl silicone membrane is used to interface the detector with the atmosphere; and it provides enrichment of formaldehyde at the operating pressure of 50 m torr of more than 150 times the normal concentration within the cavity at that pressure. The instrument exhibits very high selectivity, good stability and linearity, and good sensitivity. (Author summary modified)

50743 ***APTIC NO. 73464***

Hughes, Ernest E.

DEVELOPMENT OF STANDARD REFERENCE MATERIALS FOR AIR QUALITY MEASUREMENT. Preprint, Instrument Society of America, Pittsburgh, Pa., 13p., 1974. (Presented at the Instrument Society of America, International Instrumentation - Automation Conference Exhibit, New York, Oct. 28-31, 1974.)

The preparation of carbon monoxide and nitric oxide standards as well as sulfur dioxide and nitrogen dioxide permeation tubes is described. The major difficulty associated with CO standards is the tendency of the CO concentration to decline with time. The individual container is critical relative to stability, and stainless steel containers, though economically impractical, give the greatest long-term stability. However, the application of a thin coat of ceresin wax to the interior surface of a mild steel cylinder provides for adequate long-term stability, as evidence by data that show no evidence of composition change after one year of storage. The preparation of nitric oxide standards in nitrogen by gravimetric, pressure, and dynamic dilution techniques generally results in good agreement between the three methods. Neither wax lining of the cylinders nor the use of stainless steel cylinders appear to offer any advantage over steel cylinders of Department of Transportation 3AA specification. Sulfur dioxide permeation tubes can be developed with a permeation rate accuracy of + or - 0.5% for 5 and 10-centimeter lengths, and nitrogen dioxide tubes can be calibrated with a similar accuracy, though in the latter case greater caution must be exercised when weighing tubes because of the hygroscopic nature of the external surface of the permeating area.

50744 **APTIC NO. 70365**

Imamura, Kiyoshi, and Toru Fujii

STUDIES ON HYDROCARBONS IN AIR(3) QUANTITATIVE ANALYSIS OF TOLUENE BY GC-MS. *(Taikichuno tankasuiso ni kansuru kenkyu (3) GC-MS ni yoru toruen no teiryo). Text in Japanese. Preprint, Japan Chemical Society, p. 535, 1974. (Presented at the Japan Chemical Society, Fall Meeting, 31st, Sendai, Japan, 1974.)*

A gas chromatographic-mass spectrometric (GC-MS) single ion monitor method was used for quantitative anlaysis of toluene in air. The instrument was a Shimazu LKB-9000 GC-MS, and the column for the GC was packed with Benton 34 + DDP (5% + 5%) with chromosob W (60/80 mesh) as a solid support. Two ions with m/e of 92 and 91 were found with different intensities, the former being the parent ion, while the latter was the tropylium cation. The intensities of the two ions increased with increasing ionization potential, reaching to a maximum at 60-70 eV. Linear calibration curve of the tropylium cation intensity was obtained between 0.2 ng and 2.3 ng of toluene. The standard deviation was approximately 4.5% at 2.3 ng toluene. The minimum quantity for the determination of air sample containing a ppb order of toluene was about 2 ml.

50745 **APTIC NO. 70515**

Ishida, Shozo

FEASIBILITY STUDY OF EXHAUST GAS MEASURING DEVICE FOR CAR TESTS. *(Jidosha kensayo haishutsu gasu sokutei sochi no jitsuyoka ni kansuru kenkyu). Text in Japanese. Unyusho Shiken Kenkyu Seika (Rep. Min. Trans. Res. Exper.), no. 20:95-99, 1974.*

A gas detector for carbon monoxide, hydrocarbons, and nitric oxide was constructed after preliminary studies were carried out on gas interferences for NO determination and on the improvement of tailing in HC determination. The detector consisted of an analyzer, a sampling unit, a control unit, and an indicator. The characteristics of the detector were: measurement ranges of 0-10% CO, 0-1000/3000 ppm HC, and NO, 0-1000/3000 ppm NO; reproducibility of 1% on full-scale; zero and span drifts at plus and minus 2% for 8 hr; 90% response within 7 sec; up to 2% interference by moisture and 1% interference by carbon dioxide on full-scale; hang-up within 5% after 30 sec at same range and after 60 sec at high to low range switch; accuracy within 3% on full-scale (exhaust gas dependent).

50746 **APTIC NO. 70307**

Ishiguro, T., T. Hasegawa, Y. Shigeta, M. Sakata, H. Nagai, H. Kitamura, and M. Seki

GAS CHROMATOGRAPHIC ANALYSIS OF DIMETHYLDISULFIDE IN AMBIENT AIR. *(Taikichu niryuka mechiru no sokutei hoho ni kansuru kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):459, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 310.)*

Analysis of dimethyldisulfide (10 ppb) was effected by two methods outlined in Report No. 9 of the Environmental Agency, Japan. In the first method, a sampling bottle, treated with phosphoric acid, filled with pure nitrogen gas, then evacuated, was used to collect the gas sample. The gas sample is collected in a concentration vessel (and cooled in liquid oxygen) by alternate evacuation and flushing of the sample bottle. Gas chromatography is conducted on the gas sample after removal of the liquid oxygen coolant. In the second method, a Tedlar bag was used for gas sample collection. The bag was then connected to a gas concentration vessel, cooled in liquid oxygen, and a gas sample was transferred to it. Procedures described for the first method were then followed. After four trials with each method, fluctuation was within 10%.

50747 **APTIC NO. 70648**

Ishikawa, K., N. Kano, O. Hamamoto, and K. Saeki

STUDIES ON THE DETERMINATION OF SULPHUR DIOXIDE (1) - THE REPEATABILITY WITHIN THE SAME LABORATORY AND THE REPRODUCIBILITY BETWEEN THE DIFFERENT LABORATORIES. *(SO2 ni kansuru kenkyu (1) - bunseki jo-kan narabi ni bunsekijo-nai kurikaeshi gosa ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):431, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 282.)*

Five analytical methods for sulfur dioxide including alusenazo III, neutralization, barium chloranilate, conductivity, and infrared methods were examined for thei dependability. Gas containing 100 ppm or 1000 ppm sulfur dioxide and solid mixtures of sodium sulfate and sodium chloride (1:1) were used as samples. Chemical methods resulted in greater differences among 17 experimental stations who joined the program. The error of sampling was greater as the concentration became lower; the neutralization method could be used for the measurement of 100 ppm SO2 when N/50 NaOH was used to remove carbon dioxide. The results of continuous methods were approximately 10% lower than those of chemical methods.

50748 **APTIC NO. 70299**

Iwasaki, Y., H. Fukushima, H. Onozuka, T. Ishiguro, and T. Ohira

STUDY ON SELECTION OF PERSONNEL AND SIZE OF OLFACTORY PANELS. *(Shukaku paneru no sentei oyobi ninzu no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):450, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 300.)*

A panel was selected to smell three standard odors (iso-valeric acid, skatole, and cyclotene) and its findings were analyzed with respect to sex, age, physical condition, tobacco usage, confidence, and expertise in odor detection. A normal distribution for human odor detection ability was assumed. A range of plus or minus 10% was the goal for reliability.

50749 **APTIC NO. 70714**

Jaenicke, R. and I. H. Blifford

THE INFLUENCE OF AEROSOL CHARACTERISTICS ON THE CALIBRATION OF IMPACTORS.

J. Aerosol Sci., 5(5):457-464, 1974. 11 refs.

Experiments investigating the influence of aerosol characteristics on the calibration of impactor collection efficiency were performed, with the results being compared to earlier experimental calibrations and recent theoretical calculations. Rectangular jet impactors were calibrated with a procedure which avoided the production of multiple polystyrene particles. The original hydrosol of the polystyrene particles was reactivated ultrasonically to break up all multiple particle agglomerates. Large dilutions with distilled water were used to minimize the formation of agglomerates during spraying of the hydrosol. Special variable-slit impactors were constructed for calibration purposes, and an optical particle counter was used to monitor the performance of the aerosol generator. The calibration curve obtained differed greatly from earlier calibrations, though it was in close agreement with recent theoretical calculations. Systematic changes in calibration curves over the years and their departure from the present results suggest that earlier calibrations may have been affected by the character of the calibration aerosols.

50750 **APTIC NO. 73044**

Jepsen, Anders F.

DYNAMIC AIR POLLUTION MONITORING AND PREDICTION.

Environmental Measurements, Inc., Md. 8p., 1974. 1 ref. (Presented at the Air and Stream Improvement Conference, 9th, Toronto, Ontario, Sept. 23-25, 1974.)

Dynamic air pollution monitoring (data acquisition with moving sensors) is discussed, with particular reference to the pulp and paper industry. A moving laboratory with a remote sensor and point monitors is capable of separating a contaminant plume from other such plumes which may be in the area, thus establishing whether paper mills located near other pollution sources in an area are the cause of the problem. By traversing upwind as well as downwind, the mobile laboratory establishes the background into which the plume is ejected; it then maps the downwind dispersal patterns to locate the point of maximum ground level concentration and to measure the horizontal stability. A remote sensor is set up to make lateral observations of the plume. It is first aimed upwind to measure the vertical profile of the plume to determine the plume's vertical stability and the effective stack height. Simultaneously, dynamic meteorological measurements are made to determine the characteristics of the dispersing atmosphere. Such dynamics measurements can identify the contributions of different sources and provide the data for model tuning.

50751 **APTIC NO. 70516**

Kaminari, Teruo and Hitoshi Nagai

THE POSSIBILITY FOR SIMPLIFYING DUST MEASUREMENT BY USING MEASUREMENT EQUIPMENT BY THE PILLAR CO.

(Piraru-sha no sokuteiki o mochiita kanika no kanosei: baijinryo kani sokuteiho). Text in Japanese. Kogyo Kanetsu (Ind. Heating), 11(5):313-317, 323, Sept. 1974. 4 refs.

Characteristics of an OPASTOP GP analyzer for measuring the fly ash concentration are described. With OPASTOP GP, light scattering by airborne fly ash is measured with glass fiberscopes to determine concentrations. In the usual procedures, exhaust gas is collected with dust tubes (JIS Z8808 analyzer) or filter paper (Bachrach analyzer) to determine concentrations. In test runs, different heavy oils were burned to heat a steam boiler, and the fly ash concentration was measured with the three measuring devices at a mid-point spot in the cylindrical flue. It was determined that OPASTOP GP analyzer can be used to measure low to high concentrations of fly ash, even concentrations so low as to be almost invisible to the naked eye. The OPASTOP GP analyzer can be connected to alarm systems for monitoring combustion conditions. It is also possible to use the analyzer in conjunction with other automatic control and recording equipment...

50752 **APTIC NO. 70697**

Kano, N. and S. Yoshimoto

STUDIES ON THE DETERMINATION OF SULPHUR DIOXIDE (2) - THE HANDLING ERROR OF EXPERIMENTAL WET GAS METERS.

(SO2 teiryo ni kansuru kenkyu (2) - shisshiki gasu meita no toira tsukai gosa ni tsuite -). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):432, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 283.)

Twelve gas meters were checked for performance using a standrrd gas meter. The machine condition and operating condition greatly affected the performance of the gas meter. The inclination of water level had a noticable effect on the indicator. Analysis of answers of questions given to 19 gas meter owners revealed that about 1/3 of the machines were not correctly handled and about 2/3 of the machines were not rectified. More than half of the operators made inproper readings.

50753 **APTIC NO. 70304**

Kasahara, M., S. Harada, H. Eguchi, and H. Hamada

SAMPLING METHOD FOR THE DETERMINATION OF TRACE ORGANICS FROM THE FUME INCINERATOR.

(Toshi gasu nensho-shiki dasshu sochi no dasshu seibun sanpuringu hoho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):456, Nov. 1974. 5 refs. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 307.)

Three methods are described for analyzing trace odorants in gas samples of high temperature and high moisture content. A glass vacuum sampling device is easy to use, and can be used when component concentrations are fairly high. Adsorption and condensation on the vessel occurs, but heating to 80-100 C results in nearly 100% recovery of the materials. When component concentrations are low, and amount of drainage is high, absorption methods are used. The absorption solvent must be of low combustibility, and minimally affected by the high amount of carbon dioxide present. Adsorption on porous polymer beads is the third method of trace odorant analysis. Adsorption of water (present in amounts from 5-20%) does not occur, and concentration of the samples was facilitated. Gas chromatography analysis resulted in accurate quantitation of trace amounts.

50754 **APTIC NO. 70635**

Kawai, Yoichi

THE RECENT TREND IN POLLUTION ANALYZER.

(Kogai bunsekikei no saikin no doko ni tsuite). Text in Japanese. Ammonia to Kogyo (J. Ammonium Ind.), 27(1):27-39, 1974. 4 refs.

Various analyzers for atmospheric and water pollutants are described in reference to the pollution control standards. The check points for selecting measurement methods, analyzers, installation locations, and sampling points are listed. The measurement methods for each pollutant are summarized in tabular form. An examples, the measurement methods for sulfur oxides, nitrogen oxides, suspended particulates, and sulfur content in fuel are described with procedures and flow sheets of measurement systems. For the measurement of pollutants in water, the measurement items and procedures are reviewed with flow sheets of systems. The systems approach to environmental pollution control plans is discussed with examples of the total control system, air pollution monitoring system, and water pollution control system.

50755 **APTIC NO. 73163**

Kerker, Milton

LIGHT SCATTERING BY SINGLE AEROSOL PARTICLES. *Nat. Bur. Stand. U. S. Spec. Publ., no. 412:13-20, Oct. 1974. 3 refs. (Presented at the National Bureau of Standards Seminar on Aerosol Measurements, Gaithersburg, Md., May 7, 1974.)*

Light scattering measurements of aerosol particles are reviewed in terms of difficulties associated with the inversion of light scattered by dispersion, experience with scattering by single particles, and calculation of the response curves for commercial particle counters. Light scattering data for dispersions are increasingly difficult to obtain since the particle size distribution broadens as the light signals are averaged over the distribution, thus washing out information. Narrow distributions can, however, yield quite accurate information. Single particle light scattering studies using silica fibers and unpolarized light of 546 nm indicate that the best fit between experimental observations and theory occurs for a refractive index of 1.46 and a particle circumference to wavelength ratio of 4.00; size determinations can be made to an accuracy of about 0.25%. Response calculations for five commercial light-scattering aerosol particle counters reveal a strong dependence of the response on both the real and the imaginary part of the refractive index, as well as a multivalued response for a given refractive index over the submicron range for three of the five instruments. Thus, particle size determination with any of these instruments is highly precarious whenever the refractive index of the particles is unknown.

50756 **APTIC NO. 73008**

Knollenberg, Robert G.

ACTIVE SCATTERING AEROSOL SPECTROMETRY. *Nat. Bur. Stand. U. S. Spec. Publ., no. 412:57-64, Oct. 1974. (Presented at the National Bureau of Standards Seminar on Aerosol Measurements, Gaithersburg, Md., May 7, 1974.)*

Aerosol sizing methods are reviewed, with particular emphasis on active scattering aerosol spectrometry. Active scattering spectrometers use the active open cavity of a laser as the source of particle illumination, with the interferometric aspects of the system producing both forward and backward scattered radiation at all collecting angles. This, coupled with the use of an extremely intense source and the fact that the collecting optics solid angle can be considerably greater than 1 steradian, results in a highly sensitive system capable of sizing particles with diameters of several hundred Angstroms using solid state silicon detectors. Size measurements are obtained from the pulse height, and the sensitivity in terms of converted photocurrent is 1 microampere of signal per micron squared of scattering cross section. A field depth of + or - 5 mm can be obtained without appreciable change in the scatter function. (Author abstract modified)

50757 **APTIC NO. 71437**

Kusuya, Y., K. Igarashi, and K. Oikawa

STUDY OF CONTINUOUS EXTRACTION FOR AIRBORNE METALS. *(Taiki fuyu ryushijo busshitsu chu no kinzoku seibun bunseki ni okeru renzoku chusutsuho no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):224, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 83.)*

A closed system, continuous extraction technique for metallic components (iron, nickel, copper, cadmium, lead) in airborne particulates is described. Ashed material for extraction is placed in a glass holder, and placed above a round-bottomed flask containing the extractant, 30 ml of hydrochloric acid. The flask is heated with a mantle heater. A water-cooled condenser, attached above the sample holder, cools volatilized extractant for reextraction use. Extraction times of 60, 120, 180, and 240 min were investigated. The extracted material was treated in the usual way for analysis. Except for Cd, standard deviation in results was smaller than that obtained through the usual extraction procedures.

50758 **APTIC NO. 72974**

Lao, R. C., R. S. Thomas, L. Dubois, and J. L. Monkman

IMPROVED METHODS OF SAMPLING AND ANALYSIS OF AIRBORNE HAZARDOUS PARTICULATE POLLUTANTS. *Preprint, Environment Canada, Ottawa, Air Pollution Control Directorate 7p., 1974. (Presented at the Health Effects of Environmental Pollution, International Symposium Paris, France, June 24-28, 1974.)*

Problems ivolved in the collection of airborne particulates composed of compounds with high vapor pressures are discussed. Although the analysis of volatile compounds of arsenic, selenium, and mercury as well as the analysis of polynuclear aromatics is continually being upgraded with such techniques as gas chromatography, mass spectrometry, and spectrophotometry, few changes are evident in the collection of such compounds. Particulate pollutants having high vapor pressures appear capable of either passing through conventional filter media without being trapped or evaporating from the collected particulates with the continuing passage of the air stream. Calculated equilibrium vapor concentrations for various polynuclear and arsenic compounds indicate that vapor losses during sampling may be appreciable.

50759 **APTIC NO. 73123**

Maienthal, E. June

THE APPLICATION OF LINEAR SWEEP VOLTAMMETRY TO THE DETERMINATION OF TRACE ELEMENTS IN BIOLOGICAL AND ENVIRONMENTAL MATERIALS. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 243-246. 6 refs. (June 11-13.)*

The application of differential linear sweep voltammetry to the analysis of various trace metals and organometallics in airborne particulates, soil samples, biological tissues, coal and fuel oil, and fly ash is described. The polarographic technique can be used to analyze such samples for aluminum, titanium, iron, nickel, copper, zinc, arsenic, antimony, cadmium, lead, and bismuth. The method usually involves wet or dry ashing of the sample along with a simple chemical separation such as solvent extraction, followed by voltammetric measurement. The latter is made by applying a rapid linear voltage sweep (250 millivolts/sec) in either the anodic or cathodic direction during the last 2 sec of the lift of a mercury drop mechanically detached every 7 sec. Standard deviations (of single determinations) as low as five parts in 10,000 at the 100 ppm level can be obtained.

50760 **APTIC NO. 70765**

Mainwaring, Sylvia J.

THE SIZING OF PARTICULATES IN POLLUTED AIR. *Clean Air J. Clean Air Soc. Australia New Zealand, 8(3):59-62, Aug. 1974. 23 refs.*

Methods for collecting and reporting particulate size data are reviewed. Optical techniques are suitable for particle sizes down to 0.3 micron, and electron microscopy can be used for particles in the sub-micron range. Light scattering methods can be used in atmospheric studies of particles with diameters between 0.3 and 7.0 micron and do not modify the particles examined. Electrica counters are capable of precipitating onto a positive electrode all particles above a certain diameter, and the voltage of the positive electrode can be scanned to collect a range of diameters between 0.0075 and 0.6 micron. The largest group of collectors used for atmospheric monitoring are those that determine mass distribution. These are calibrated in terms of aerodynamic diameters and thus are directly comparable with the respiratory system. The most frequently used such device is the cascade impactor which provides satisfactory separation down to diameters of 0.25-1 micron, dpending on whether a high-volume or low-volume type is used. Size distribution data often adhere to the Junge power law or the log normal distribution. Mass distribution data with respect to diameter are often fitted to a log normal curve, with good approximations being possible for particle diameters between 1 and 8 micron. Although there are dangers in making assumptions about actual particle size distributions from experimental data, such graphs have the advantages of being easily computed and providing a comparison between different sets of experimental data.

50761 **APTIC NO. 70497**

Mamuro, Tetsuo

ACTIVATION ANALYSIS OF ENVIRONMENTAL POLLUTANTS. *(Kankyo osen busshitsu no hoshaka bunseki) Text in Japanese. Radioisotopes, 23(6):355-363, June 1974 50 refs.*

The analysis of atmospheric suspended particulates, environmental water, biological materials, and foods is reviewed. Sampling of atmospheric suspended particulates is made mostly with the aid of air samplers, which are roughly divided into 2 classes, high volume samplers and low volume samplers. In the former, air is allowed to pass through a large filter, about 20 cm by 25 cm, at a rate of 1.3 sq m/min. In the latter, air is passed through a small filter about 4.7 cm in diameter, at a rate of 20 l/min. The samples thus collected are suitable for analysis with instrumental neutron activation analysis (INAA) By irradiation for 5 min, aluminum, chlorine, calcium, titanium, vanadiumm manganese, and indium were successfully determined. After irradiation for 1 - 10 hrs, 29 elements including sodium, potassium, scandium, chromium, iron, and cobalt were determined. The accuracy of determination is 2-3%. The sampling of environmental water must be made carefully to eliminate the effect of vessels, due to dissolution of the vessel materials and the adsorption of the materials onto the walls of the vessel. The application of INAA was successful in the analysis of drinking water, waste waters discharged from factories, sea water,and various inland water. The analysis of mercury and other metallic elements in hairs and nails was successfully made by INAA.

50762 **APTIC NO. 70598**

Mantani, T., H. Okuda, Y. Kimura, and T. Uemura

MEASUREMENT OF DUST CONCENTRATION BY BETA-RAY TRANSMITTANCE. *(Beta-sen tokaho ni yoru baijin-ryo sokutei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):481, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974. Paper 329.)*

For simplified and accurate measurement of flue dust at low concentrations, an automatic continuous measurement device utilizing beta-ray transmittance was developed. The dust in the flue gas was collected on a glass fiber filter, and the dust concentration was determined by measuring the difference in beta- ray intensity transmitted through the blank filter and the filter with dust sample. Prometium 147 (half-value period 2.6 year, maximum energy 0.223 MeV) was used as the beta-ray source. The relationship between the dust weight determined gravimetrically and by beta-ray transmittance measurement was linear.

50763 **APTIC NO. 70669**

Markland, J.

ANALYTICAL CHEMISTRY IN PUBLIC SERVICE. *Analyst (London), vol. 99:810-816, Dec. 1974. 19 refs.*

The use of analytical chemistry in public service applications is generally reviewed. Analysis includes any process for determining any fact as to the nature, substance, or quality of any material. Applications of analytical chemistry in public service have included analysis of food to meet the Pure Food Act and to protect the public, of soils, of chemical drugs, of water to determine water pollution, of air to determine air pollution, of biological substances such as blood and urine, and of other substances such as tobacco, hydrocarbon oils, and alcoholic liquors. The history of food and drug analysis and the present analysis of food, air, water, solids, and crops are reviewed.

50764 **APTIC NO. 73139**

Marple, V. A.

DEVELOPMENT, CALIBRATION AND APPLICATION OF SIZE DISTRIBUTION INSTRUMENTS AT THE UNIVERSITY OF MINNESOTA. *Nat. Bur. Stand. U. S. Spec. Publ., no. 412:149-176, Oct. 1974. 15 refs. (Presented at the National Bureau ofStandards Seminar on Aerosol Measurements, Gaithersburg, Md., May 7, 1974.)*

Progress in the development, calibration, and application of size distribution instruments at the University of Minnesota is reviewed. Topics covered include: the development and operation of an electrical aerosol analyzer for in-situ measurements over the 0.003-1.0 micron diameter range; the use of a vibrating orifice monodisperse aerosol generator for calibrating aerosol measuring and sampling equipment; the generation of submicron (below 0.5 micron) aerosols with pneumatic atomization and electrostatic classification; the calibration of condensation nuclei counters; the use of submicron aerosol generators for the calibration of the electrical aerosol analyzer; calibration methods for optical particle counters using ideal and nonideal aerosols; the development of various aerosol size distribution measurement systems; and conclusions drawn from field studies of atmospheric aerosol particle size distributions. Fine particles constitute about 1/3 of the total atmospheric aerosol mass on the average, with moderately polluted urban areas showing fine particle size concentrations of around 50 micrograms/cu m and coarse particle concentrations of around 120 micrograms/cu m.

50765 **APTIC NO. 73007**

Marshall, Thomas R., Charles S. Parmenter, and Mark Seaver

THREE HUNDRED SIXTY DEGREE SCATTERING DIAGRAMS FROM INDIVIDUAL AEROSOLS IN A FLOWING STREAM. *Nat. Bur. Stand. U. S. Spec. Publ., no 412:41-56, Oct. 1974. 7 refs. (Presented at the National Bureau of Standards Seminar on Aerosol Measurements, Gaithersburg, Md., May 7, 1974.)*

Scattering diagrams (360 deg) were obtained from individual aerosols beam. A computer analysis of diagrams from a monodisperse aerosol (polystyrene spheres with a mean diameter of 1.2 micron) indicated that both the diameter and refractive index can be determined from each scattering diagram to compile a statistical characterization of the aerosol. Diameter precision was about 0.4%, and the refractive index was determined to within 0.7%. The method offers a practical approach to the routine characterization of aerosol sprays containing spherical particles with diameters ranging from 0.3-20 micron. The refractive index determination reveals differences between particle composition and bulk composition of the parent material as well as composition changes during the aging of aerosol sprays. (Author abstract modified)

50766 **APTIC NO. 70613**

Minase, Koichi

THE APPLICATION OF REMOTE SENSING FOR LARGE AREA ENVIRONMENTAL INVESTIGATIONS. *(Koiki knakyo chosa ni tsuite no rimoto senshing no tekiyo). Text in Japanese. Denryoku Keizai Kenkyu (Power Econ. Stud.), no. 5:111-121, March 1974.*

The technique of remote sensing which is indispensable to large area environmental investigations such as the case of site planning for atomic or thermal power plants is described. Remote sensing is defined as a sensing method for objects or gathering information about such objects by means of electromagnetic wave radiation or energy reflection. The nature of the electromagnetic wave and its application to remote sensing are discussed. Remote sensing is classified into several categories according to the type of sensing device, the receiving method of information, and the information processing method such as the image method which includes photographic and nonimage methods. A brief description of identification method of object by photographic image in which the object is identified by its characteristic reflection is given. Examples of spectral radiance of green vegetation, sandy soils, and muddy river water and variation in spectral radiance with the type of trees are shown in diagrams. The plant acitivity in terms of the water content can be measured by spectral radiance. The nonimage method is described in which the information is automatically processed by machines. The present status of remote sensing in Japan, U.S.A. and Canada are reviewed. The Earth Resources Technology Satellite and other satellites can be used for remote sensing.

50767 **APTIC NO. 70650**

Mizuhata, T., M. Ikeda, I. Maeda, H. Hata, and Y. Oka

EFFECTS OF SULFUR OXIDES AND NITROGEN OXIDES ON DUST CONTENT MEASUREMENTS IN STACK GAS. *(Endo haigasu-chu no baijin-ryo no sokuteichi ni oyobosu iousankabutsu oyobi chisso sankabutsu nado no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):427, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 278.)*

Dusts in flue gas were sampled with a Toyo No. 86 R glass fiber filter and a Toyo No. 88R silica fiber filter paper, and sulfate ion, nitrate ion, and nitrite ion were extracted and determined. A significant reaction between sulfur oxides and glass fiber filter was observed, while no noticeable reaction was found between sulfur oxides and silica fiber filter paper. Sulfate ion extracted from the silica fiber filter paper was from the sulfur compounds in dusts. Sulfur trioxide was responsible for the reaction between sulfur oxides and glass fiber. The reaction between nitrogen oxides and filter paper was less significant than that between SOx and filter paper. There was the possibility of substances other than SOx and NOx reacting with filter paper.

50768 **APTIC NO. 68439**

Morita, Yazaemon

ANALYTICAL METHOD FOR NITRIC CONTENT IN FUELS BY AUTOMATIC COULOMETRIC TITRATION. *(Jido denryo tekitei ni yoru nenryochu no chissobun no bunsekiho). Text in Japanese. Sangyo Kogai (Ind. Publ. Nuisance), 10(9):2136-2141, Sept. 1974. 14 refs.*

Nitrogen, an impurity in fuel, is a cause of air pollution even in trace amounts. The working principles and the structure of the automatic analyzer utilizing the coulometric titration method are discussed. The cell consists of a contrasting electrode, detection electrodes, a generation anode, a generation cathode, a decomposed gas entrance, and a supplementary tube. As the test material is introduced from the entrance, it is gasified and goes through the catalytic layer; by reduction thermolysis the nitrogen in the test material is quantitatively converted to ammonia; simultaneously, sulfur and halogens become gases and pass through the absorption layer. They are completely eliminated. Methane and ammonia created by carbon are sent to the coulometric titration cell and methane is emitted after passing the cell. Sometimes the measurements may be lower than actual nitric content; this is probably caused by the instability of the compound, which causes part of the N-C bond to break off and become nitrogen gas before the N-NO bond is broken and forms ammonia. In order to control this, the temperatures of the material gasification cell and the thermolysis furnace must be adjusted to meet the requirements of the compound. For compounds with the thermal stability of an N-NO bond the temperature conditions must be examined before analysis.

50769 **APTIC NO. 67085**

Mudgett, P. S., L. W. Richards, and J. R. Roehrig

A NEW TECHNIQUE TO MEASURE SUFURIC ACID IN THE ATMOSPHERE. *Preprint, Cabot Corp., Billerica, Mass., 35p., 1974 (?). 8 refs.*

A prototype instrument was developed for routine monitoring of sulfuric acid in the air. Ambient air is passed through a filter to collect H_2SO_4 and other particulates; the H_2SO_4 is then separated by volatilization with warm, dry air; the amount of sulfuric acid volatilized is then determined with a commercially available flame photometric detector which is highly sensitive and specific to sulfur-containing compounds. Preliminary experiments were undertaken to see if the proposed monitoring method could actually be used. The experiments were successful enough that a prototype instrument was built to carry out the operations automatically. The flame photometric detector operation and calibration, the sulfuric acid aerosol generator used in the tests, the apparatus and procedures for the volatilization experiments, filter materials, use of volatilization aids, radioactive tracer experiments, the prototype monitor, and experimental results are discussed.

50770 **APTIC NO. 70305**

Nagase, M. and H. Ota

DETERMINATION OF LOWER FATTY ACIDS IN ODORS. *(Akushu to shite no teikyu shibosan-rui no sokuteiho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):457, Nov. 1974. 3 refs. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 308.)*

Analysis of lower fatty acids was conducted by selective absorption of these acids in sodium hydroxide solution, and collection of the resultant sodium salts. The sodium salts were acidified with formic acid, and the regenerated fatty acids were analyzed by gas chromatography. As an internal standard, trans-crotonic acid was used. Malodors emanating from a pig manure drying installation were analyzed, and six fatty acids (acetic, propionic, iso-butyric, n-butyric, iso-valeric, n-valeric) were detected without difficulty. Recovery was nearly 100% for all of the acids.

50771 **APTIC NO. 70301**

Nagata, Y., N. Takeuchi, T. Ishiguro, T. Hasegawa, and Y. Shigeta

STUDY OF RELATIONSHIPS BETWEEN ODOR INTENSITIES AND CONCENTRATIONS OF ODORANTS BY ODOR-FREE ROOM METHOD. *(Mushushitsuho ni yoru akushu no busshitsu nodo to shuki kyodo oyobi fukaido to no kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):452, Nov. 1974. 2 refs. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 302.)*

Five malodors (hydrogen sulfide, methyl mercaptan, methyl sulfide, ammonia, and trimethylamine) were smelled by a six-member panel to determine relationships between odorant concentration and odorant intensity as well as degree of unpleasantness. An odor-free room with six smelling windows was used. Odor intensities were evaluated on a scale of 6. A logarithmic relationship was found between odorant concentration and intensity, and between odorant concentration and degree of unpleasantness.

50772 **APTIC NO. 70636**

Nakao, S. and S. Momose

ABOUT THE SAMPLING AND ANALYTICAL METHODS FOR HCL IN MOISTENED EXHAUST GASES. *(Endo haigasu ni okeru enka suiso no sanpuringu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):434, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 285.)*

Experiments were carried out to study the effect of heating the sampling apparatus and the possibility of a long distance sampling method. A sampling tube connecting the sampling bottle and the stack was heated at a desired temperature, and hydrogen chloride in the exhaust gas was analyzed by the JIS-K-0107 silver nitrate method. The HCl distribution varied with the heating method. When heat was applied on the tube covering the portion in the stack wall, more than 90% of the HCl was collected in the first sampling bottle while a few percent remained in the tube. Without heat, about 90% of the HCl remained in the tube, with the rest collected in sampling bottles. Long distance (remote) sampling up to 60 m was possible.

50773 **APTIC NO. 70651**

Noma, M., R. Suzuki, A. Moritani, T. Nakaya, N. Saito, R. Inoue, M. Fujita, M. Ito, and H. Ota

COMPARATIVE OBSERVATION ON THE RESULTS OF DUST CONTENT MEASUREMENT IN STACK GAS WITH GLASS FIBER AND SILICA GLASS FIBER CYLINDRICAL FILTER PAPER. *(Garasu-sei oyobi shirika garasu-sei ento roshi ni yoru baijin-ryo sokutei kekka no hikaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):428, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 279.)*

Measurements of dusts in flue gas were carried out at 32 plants with glass fiber (Toyo No. 86 R) and silica glass fiber (Toyo No. 88 R) cylindrical papers. Flue gas (200 l) was sampled by constant velocity sampling. The filter papers were pretreated at 250 deg for 2 hr, and after sampling, the papers were heated and dried at 120 deg for 1 hr. Sulfur oxides concentrations were determined by titration or by the continuous nondispersive infrared method. The interaction between SOx and the No. 86 R glass fiber filter paper became more significant as the SOx concentration increased. The weight increase of the No. 86 R filter paper was about 70% more than that of the No. 88 R filter paper at 1000 ppm SOx. No noticeable temperature or moisture effect was found on the absorption of SOx on the filter papers.

50774 **APTIC NO. 70791**

Ogawa, Hiroo, Syoji Naito, Minoru Kitazume, Yoji Yoshinaga, and Etuo Yoneyama

COMPARATIVE STUDIES ON THE MEASURING METHODS OF THE INDOOR SUSPENDED PARTICLES. *(Tatemono nai ni okeru fuyufunjin no sokutei ho no hikaku kento). Text in Japanese. Kanagawa-ken Eisei Kenkyusho Kenkyu Hokoku (Bull. Kanagawa Prefect. Public Health Lab.), no. 4:59-67, Oct. 1974. 8 refs.*

Light scattering and optical density measurements of indoor suspended particulate concentrations were compared against a standard weight concentration method. Correlation coefficients obtained from measurements in five different kinds of buildings over a 2-year period ranged from 0.918-0.987 for the light scattering and the standard weight concentration methods and from 0.475-0.808 for the optical density and standard methods. Analysis of correlations after the buildings were divided into two groups, however, yielded higher correlations between the standard method and the optical density method in contrast to the initial results obtained for all of the buildings taken as a whole. This latter correlation probably reflected the dissimilarity of both color and size of suspended dust particles. Hourly variations of dust particles showed different patterns, depending on the usage of the particular building examined.

50775 **APTIC NO. 70364**

Okuwaki, Abitsugu, Takashi Sunami, and Taijiro Okabe

OXIDATION-ABSORPTION OF NITROGEN OXIDES BY OZONE. *(Sanka chisso no ozon ni yoru sanka kyushu). Text in Japanese. Preprint. Japan Chemical Society, p. 367, 1974. (Presented at the Japan Chemical Society, Fall Meeting, 31, Sendai, Japan, 1974.)*

Gas containing 0.2-1% ozone was generated at a flow rate of 50 cc/min and mixed with a stream of nitrogen gas containing about 1000 ppm nitric oxide and having a flow rate of 350-400 cc/min. The mole ratio of 03/NO was adjusted to 0.1-1.0 by regulating the 03 concentration. The gas mixture was introduced into a 10 by 340 mm glass tube where the oxidation was allowed to occur. The resulting gas was passed through a washing bottle containing 1 N alkaline solution, by which nitrogen oxide was absorbed. The NO in N2 was determined by oxidation with potassium permanganate, reduction with Devarda s alloy and titration of the resulting NH2. The mixture of nitrate and nitrite ions in the absorbent was determined by the same method, and NO2 ion alone was determined by Saltzman method. Results showed that at 03/NO of 0.5-0.6 with a potassium or sodium hydroxide solution as an absorbent, the NO conversion was 80 to 90%. The conversion rate decreased with weak alkaline solution.

50776 **APTIC NO. 70298**

Onozuka, H., H. Fukushima, Y. Iwasaki, and T. Ishiguro

ON SENSORY TEST MEASUREMENTS OF LOW LEVEL ODOR STRENGTHS AT PLANT BOUNDARIES. *(Shikichi kyokai ni okeru teinodo iki no kanno shikenho no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):449, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 299.)*

Low concentration odors at industrial plant boundaries were measured by means of a three-point comparison method, using plastic odor sampling bags (volume, about 7 l) encased in airtight containers (volume, about 50 l). The containers were evacuated to less than 7 l of gas, and the odor samples were introduced into the sampling bags under reduced pressure during a 10-second period. Samples for testing were diluted with air to appropriate concentrations in 3-liter odor sampling bags.

50777 **APTIC NO. 72988**

Paterson, M. P.

QUALITY CONTROL IN THE MEASUREMENT OF AIR POLLUTION AND AIR CHEMISTRY. *Bull. Shell Comm. Environ. Conserv., no. 20:2-5, March 1974.*

Quality control difficulties relating to measurements of air pollution and rain chemistry are discussed. The standard method for nitrogen oxides measurement (Jacobs-Hochheiser method) appears to have consistently overestimated NOx concentrations by about a factor of two for the last 10 yr of measurements. Calcium and magnesium measurements for rain samples collected by the European Atmospheric Chemistry Network show inconsistencies between different stations, suggesting that some of the measurements are in error. There is no direct communication between the analytical laboratories within the network; thus, no samples are exchanged for comparative analysis. The lack of cross-checking between air pollution analyses and the underestimation of the difficulty of making such measurements is responsible for much of the erroneous data generated over the years.

50778 **APTIC NO. 73006**

Ranade, Madhav B.

FLOW APPARATUS FOR THE CHARACTERIZATION OF AEROSOLS. *Nat. Bur. Stand. U. S. Spec. Publ., no. 412:33-40, Oct. 1974. 1 ref. (Presented at the National Bureau of Standards Seminar on Aerosol Measurements, Gaithersburg, Md., May 7, 1974.)*

A flow apparatus for the characterization of liquid volatile aerosols ranging in size from 0.5-50 micron is described. The aerosol is injected isokinetically into the middle of a laminar uniform velocity air stream and is monitored by traversing a 90 deg light scattering photometer at various axial positions which are related to the age of the aerosol. The photometric data are reduced by Mie scattering theory on a computer and show good agreement with aerosol evaporation theory. Aside from the instrument s capability to monitor the evaporative behavior of submicron aqueous aerosols during transportation in air, the apparatus is also being used to characterize large (about 50 micron) aerosol particles under sedimentation. Portable versions of the flow apparatus are under development to characterize acid mist droplets.

50779 **APTIC NO. 70638**

Sato, K. and M. Hoshino

SAMPLING OF FLUORIDES IN STACK GAS WITH LIME TREATED FILTER PAPER METHOD. *(Arukari roshi o mochiiru endo haigasu-chu no fukkabutsu no sanpuringu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):436, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 287.)*

A filter paper holder consisting of a heating thermocouple and two layers of filter paper, a teflon filter paper, and an alkaline filter paper, was used for fluoride sampling. The filter paper was pretreated with a 10% sodium carbonate solution and dried. The sampling velocity was 10 l/min, and the filter paper flow rate was 0.35 l/sq cm/min. The filter papers were then immersed in 25 ml of sodium citrate buffer solution for 30-60 min, and the fluoride was determined by a fluoride ion electrode. More than 99% of the fluoride was collected.

50780 **APTIC NO. 73065**

Shofner, Frederick M., Gunter O. Schrecker, Thomas B. Carlson, and Ronald O. Webb

MEASUREMENT AND INTERPRETATION OF DRIFT-PARTICLE CHARACTERISTICS. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 427-454, 1975. 6 refs. (March 4-6.)*

The measurement and interpretation of drift-particle characteristics associated with cooling towers are discussed. Representative accuracies associated with data generated by laser light scattering, sensitive paper, and isokinetic sampling techniques are around + or - 15% for particle density distributions resulting from typical evaporative cooling device installations. The accuracy of particle density distribution data interpretation strongly depends on maintenance of calibration and the acquisition of a solid statistical data base. Particle density distribution is thhe most basic and important drift parameter for predicting transport. In contrast, mass measurements which necessarily report an apparent drift water mass are of no utility in evaluating the environmental effects of a cooling system. (Author conclusions modified)

50781 **APTIC NO. 71266**

Sweeten, John M., Donald L. Reddell, and Hal B. H. Cooper

ODOR MEASUREMENT IN LIVESTOCK FEEDING OPERATIONS. *Air Pollution Control Assoc., Pittsburgh, Pa., Southern Section and Technical Council, Control Technol., Agric. Air Pollut., Memphis, Tenn., 1974, p. 55-80. 25 refs. (March 18-19.)*

Techniques for measuring odors from livestock feeding operations are reviewed, and field tests on the application of the scentometer are reported. Present odor intensity measurement methods include: static and dynamic vapor dilution, liquid dilution, and matching standards (comparative) tests. Factors that limit the accuracy of odor measurement under field conditions include: climatic influences, observer effects, and physical/chemical changes (odorant interaction and odorant-rust relationships). Field tests indicate that the scentometer is useful for identifying primary odor sources within livestock feed operations. The minimum odor level that can be reasonably expected within cattle and swine feeding operations appears to be about 7 dilutions to threshold. Persistent odor intensities of 170 dilutions to threshold or more are considered unreasonable.

50782 **APTIC NO. 70661**

Szivos, K., L. Polos, I. Feher, and E. Pungor

AN ATOMIC ABSORPTION METHOD FOR THE DETERMINATION OF LEAD IN AIR. *Chem. Eng. (Budapest), 18(4):281-287, 1974. 15 refs.*

An atomic absorption method for the determination of lead in air was used to analyze air quality at a busy area of Budapest. The air was sampled by a personal sampler carried by persons on street duty at one of the busiest spots in Budapest. The air sample was pumped through a membrane filter type Synpor-3. The filter was destroyed in the 3:2 mixture of strong nitric acid/hydrogen peroxide, the acid was distilled, and the residue was then dried and filled to 2 ml with an 0.5% tartaric acid solution. The results were evaluated by means of calibration curves. The method gave a standard deviation of 3-5% in 1-3 micrograms/ml concentration. In 0.5% tartaric acid solution, the sensitivity was 0.65 micrograms lead/ml 1% absorption. Thye presence of tartarate increased the sensitivity of the determination by 10-13%. A histogram was consructed of the lead contamination in air at one of the busiest spots of Budapest in 1971. The lead content of air was lower in the summer, probably due to the more intense air currents. The samples contained 0.6-13 micrograms of lead, depending on the amount and on the pollution of the air driven through the sampler. (Author summary modified)

50783 **APTIC NO. 73019**

Thomas, Robert W., Keith Guard, Alfred C. Holland, and John F. Spurling

OZONE MEASUREMENT SYSTEMS IMPROVEMENTS STUDIES. *Wolf Research and Development Corp., Riverdale, Md. and National Aeronautics and Space Administration Wallops Flight Center, Wallops Island, Va., NASA Contract NAS6-2173, NASA TN D-7758, 95p., Aug. 1974. 23 refs.*

NTIS: N-74-31865

An initial study of techniques for measuring atmospheric ozone carried out as the first phase of a program to improve O3 measurement techniques is summarized. The study concentrated on two measurement systems, the Electro Chemical Cell Ozonesonde and the Dobson Ozone Spectrophotometer, and consisted of two tasks. The first consisted of error modeling and system error analysis of the two measurement systems. Under the second task a Monte Carlo model of the Dobson O3 measurement technique was developed and programmed for computer operation. The model was used to study the effects of molecular and aerosol scattering on O3 inferred from Dobson direct sun and zenith sky observations. Estimates of the errors in total O3 data due to errors in the Dobson measurement process, in instrument calibration and adjustment, and in the assumptions made in deriving the data reduction equations were determined. (Author summary modified)

50784 **APTIC NO. 70582**

Tsuchida, Kiyoshi and Michio Ito

COMPARISON OF AUTO-ANALYZER FOR ENVIRONMENTAL NOX. *(Kankyoyo chisso sankabutsu jido sokuteiki no mondaiten ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):184, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 36)*

In order to determine the reliability of a nitrogen oxides autoanalyzer, five analyzers manufactured by two companies are compared. Using a gas bottle containing about 40 pphm nitric oxide and 40 pphm nitrogen dioxide, the gas mixture is divided into five streams and continuously sent through five autoanalyzers simultaneously. The analyses of the data given by each apparatus are compared. All five analyzers indicated a 3-6 pphm variation during a 1-hour continuous NO2 analysis. In NO analysis, the variation was much greater, especially with one company s analyzers (1-10 pphm) in which the gas flow rate varied with time as much as 50%; the other company s analyzers showed a relatively constant flow. For other aspects of instrumental performance, both makes showed within 1% of baseline and span drifts, and amplification was stable in every instrument.

50785 **APTIC NO. 70525**

Ueda, Shinya, Teruo Kaneko, Toshiyoshi Hamada, Katsumi Hirono, Yoshio Saito, and Masayoshi Nakano

HC, CO TESTED FOR AUTO EXHAUST GAS. *(Jidosha haigasu HC, CO sokutei-ki). Text in Japanese. Fuji Jiho (Fuji Elec. J.), 47(11):38-46, 1974.*

The hydrocarbon tester and carbon monoxide tester for automotive exhaust gas developed by Fuji Electric Co. are described. The HC and CO testers were designed in compliance with functional standards concerning the measurement principle (non-dispersive infrared analysis), conditions for use, basic structure, measurement range, accuracy, stability, and durability set by the Ministry of Transportation. The characteristics are the wide measurement range for HC concentration, resistance to vibration, durability, stability, and easy maintenance and compactness, for easy handling. The design specifications are given along with the description of structure of various parts and operational principle. The performance test procedures for general performance, durability, long-term measurement, and reliability are described, and test results are given. The quality control system for tester production is discussed.

50786 **APTIC NO. 70643**

Heusden, S. van

CHEMILUMINESCENT OZONE, NO AND NO2 DETECTORS. *(Ozon-, NO- en NO2-detectors gebaseerd op chemiluminescentie). Text in Dutch. Chem. Weekblad, 70(27):15-18, July 5, 1974. 9 refs.*

Autonomous apparatuses for the measurement of the ozone, nitric oxide and nitrogen dioxide concentrations in the air by chemiluminescent technique, developed for use in the Dutch air quality monitoring network, are described. One ozone detector, using ethene for the chemiluminescent reaction of ozone, has a maximum at 420 nanom, and has a detection range from 2 ppb to 1,000 ppm. The error amounts to 3%, and the time required for measurement can be reduced to 0.1 sec. Another ozone detector uses gallic acid with Rhodamine B on silicagel for the chemiluminescent reaction with an emission maximum at 560 nanom. This detector can be used for a concentration range of 0.1 ppb to 400 ppb. Normal concentrations of sulfur dioxide, nitric oxide, nitrogen dioxide, methane, carbon monoxide, and carbon dioxide do not interfere with the determination. A chemiluminescent detector for the joint determination of NO and NO2 oxidizes NO to NO2 by means of ozone, while the NO2 originally present in the air is reduced to NO for the determination of the total nitrogen oxide content at an emission peak at 1200 nanom. No interference due to SO2, CH4, O3, CO, or CO2 was observed. The range of measurement extends from 2 ppb to 50 ppm. Another chemiluminescent analyzer for ozone, NO, and NO2 uses gallic acid and Rhodamine B for the determination of ozone, while NO2 is decomposed to NO and native oxygen and further to O3 by photolysis under ultraviolet irradiation, and NO is oxidized to NO2 by a solid reagent for subsequent reaction to ozone. The limits of detectability are 0.5 ppb for nitrogen oxides and 0.1 ppb for ozone, the upper limit being 150 ppb. All these chemiluminescent detectors comprise photomultipliers and are suitable for autonomous operation for 2-3 mo.

50787 **APTIC NO. 71265**

Ward, Darold E.

PARTICULATE SOURCE STRENGTH DETERMINATION FOR LOW-INTENSITY PRESCRIBED FIRES. *Air Pollution Control Assoc., Pittsburgh, Pa., Southern Section and Technical Council, Control Technol., Agric. Air Pollut., Memphis, Tenn., 1974, p. 39-54. 6 refs. (March 18-19.)*

A method for determining particulate source strength emission factors for low-intensity prescribed forest fires is described as part of an overall program designed to provide smoke management guidelines for land management personnel. Emission rates in field experiments can be determined by positioning samplers in a vertical dimension (top samplers are above the smoke plume) and measuring the amount of air moving past the vertical array. Typical field tests involve sampling the fuel to determine the weight of fuel at a given site, monitoring wind direction and speed, and outfitting five masts with preweighed filters. Standard high-volume air samplers are located within 5 ft of each of the three masts nearest the fire, and an 8-stage Andersen nonviable particle sampler is located near the center high-volume sampler and mast. Comparisons between field measurements and laboratory measurements reveal that artificially produced fuel beds yield lower particulate production rates than fires in undisturbed natural forest fuels. Particulate concentrations in the latter situation are as high as 60,000 micrograms/cu m near the fire and decrease to less than 30,000 micrograms/cu m 10 ft away.

50788 **APTIC NO. 70748**

Wessely, Istvan

THE NEVIKI DAPOMAC DATA ACQUISTION SYSTEM FOR AIR POLLUTION MONITORING. *(A neviki dapomac meresadatgyujtoje a levego szennyezeseinek mereseben). Text in Hungarian. Magy. Kem. Lapja (Budapest), 19(8):426-429, 1974. 6 refs.*

A computerized data acquisition system (DAPOMAC NORX 211) for air pollution monitoring is described. The computer combines the techniques of high-precision analog circuits with the high resolution of digital circuits to attain quick operation and digital display. the computer utilizes a fixed program and thus does not require previous training for its operation. The system is schematically illustrated with a block diagram.

50789 **APTIC NO. 70926**

Yankovskiy, S. S. and Valery P. Kurkin

INSTRUMENTATION FOR DISPERSION ANALYSIS OF PARTICULATES IN INDUSTRY. *United States-USSR Working Group, Stationary Source Air Pollution Control Technology, Control Fine-Part. Emiss. Ind. Sources Symp. Proc., San Francisco, Calif., 1974, p. 673-694. (Jan. 15-18, Paper 28.)*

A small 11-stage impactor and a cyclone separator are described in terms of their design and applicability to particle size distribution studies of particle-laden gas streams. Both instruments analyze particles from 1-30 micron in size. The impactor consists of discs with perforations for nozzles at each level. Every other nozzle is located in the central part of the disc, with the lining alternating on the outer part of the instrument. The lining allows for dust particle collections of up to 30 mg for one level. The cyclone separator consist of three sequentially connected cyclones with diameters of 30, 32, and 16 mm and a filter at the outlet. Measurements of particle size distribution made with each instrument show that regardless of whether the sample was taken at the inlet or the outlet of the control device the particle size distributions were log-normal. Comparisons between laboratory measurements of size distribution and those made by the above two devices showed good agreement except for zinc oxide and dolomite aerosols. These two aerosols underwent coagulation, resulting in marked particle size increases.

50790 **APTIC NO. 73010**

Yanta, William J.

MEASUREMENTS OF AEROSOL SIZE DISTRIBUTIONS WITH LASER DOPPLER VELOCIMETER (LDV). *Nat. Bur. Stand. U. S. Spec. Publ., no. 412:73-88, Oct. 1974. 8 refs. (Presented at the National Bureau of Standards Seminar on Aerosol Measurements, Gaithersburg, Md., May 7, 1974.)*

A laser Doppler velocimeter was used in conjunction with a miniature wind tunnel to determine aerosol size distributions. The LDV was used to measure the particle lag of individual aerosol particles as they were accelerated through a small supersonic nozzle, and the measured velocity lag was then used in conjunction with numerical predictions to determine the particle size. The geometrical standard deviation between LDV and optical owl measurements of particles ranging from 0.45-1.30 micron was between 1.14 and 1.23. (Author abstract modified)

50791 **APTIC NO. 70300**

Yoshimoto, K., K. Koike, I. Kojima, Y. Hoshika, and S. Kadowaki

AN APPLICATION OF ODOR FREE ROOM FOR OFFENSIVE ODOR CONTROL SURVEY (2). *(Akushu kogai chosa no tame no mushushitsu no oyorei (sono 2)). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):451, Nov. 1974. 3 refs. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 301.)*

Sixty-eight lay persons who had taken a course in malodor detection were asked to smell five malodorous substances (ammonia, methyl mercaptan, hydrogen sulfide, methyl sulfide, and trimethylamine). Evaluation was attempted for any discernible relationships between substance concentration and odor intensity. An odor-free room, 10 cu m in volume, was used. Except for insensitive response to ammonia, the answers given by the lay panel in the middle odor intensity levels were not much different from those given by expert panels. There was high correlation between substance concentration and odor intensity for all five substances.

50792 **APTIC NO. 70686**

Pollution Atmospherique par Residus Organiques et Mineraux Grenoble (France), Study Group

SAMPLING AND ANALYTICAL METHODS FOR AIR POLLUTANTS. *(Methodes de prelevement et d'analyse de polluants atmospheriques). Text in French. Bull. Inform. Sci. Tech. Comm. Energ. At. (Fr.), no. 191:7-29, April 1974. 6 refs.*

Sampling and analytical methods for air pollutants are described. Gaseous air pollutants are most often sampled through bubblers with adequate absorbent liquid at efficiencies of up to 85%. Organic vapors can be concentrated on gas chromatographic columns under cryogenic conditions. Particulate matter can be separated on filters or by the electrostatic method. An automatic sequential sampler can separate gases and vapors either in a bubbler or on a column. Another dust sampler is able to sample dust quantities of up to 50 mg/day without granulometric separation, and with granulometric separation from 1 micron upward. Sulfur dioxide is determined by a spectrocolorimetric method, using West-Gaeke's reagent, while nitrogen oxides are determined by Saltzmann's reagent. The methyl orange method used for the determination of chlorine has a sensitivity of 1 microgram/cu m. Hydrofluoric acid, and soluble chlorides can be determined by means of ion-specific electrodes at a sensitivity of 0.1 microgram/cu m. Organic vapors are determined best by a combination of a gas chromatograph and a mass spectrometer, using molecular sieves as an interface. Colorimeters for SO2 and NOx vapors, chemiluminescent instruments for ozone and nitrogen oxides, infrared analyzers for carbon monoxide, fluorescence and potentiometric analyzers for SO2, and flame ionization detectors for hydrocarbons are commercially available.

1973

50793 **APTIC NO. 73016**

Boehlen, Bruno

TASKS OF MEASUREMENT TECHNIQUES IN CLEAN AIR MAINTENANCE. *(Messtechnische Aufgaben auf dem Gebiet Luftreinhaltung). Text in German. Neue Tech., 15(11):413-420, Nov. 1973.*

The importance of measuring techniques for air pollution management is discussed. Monitoring of the present state and of the current developments, as well as providing a test for the effectiveness of air pollution control strategies, are the most important instruments for decision-making in this field. The most important applications for measuring techniques are emission control, air quality monitoring, and scientific surveys. Measuring air pollutants should be guided by goals and a priority of demands. The decision to use a certain strategy for air pollution control, as well as the air pollution problems to be solved, will determine which gaps in the field of measuring techniques are to be closed.

50794 **APTIC NO. 70225**

Ferrari, L. M.

A NEW TECHNIQUE FOR OZONE MEASUREMENT. *Clean Air Society of Australia and New Zealand, New South Wales Branch, Air Pollut. Control Instrum., Proc. Symp., Sydney, Australia, 1973, p. 5-1 to 5-14. 15 refs. (Sept. 18, Paper 5.)*

Two chemiluminescent ozone monitors are discussed. The two monitoring instruments are the rhodamine B and ethylene chemiluminescent ozone monitors. Both instruments have an internal ozone calibration source periodically standardized by conventional chemical means. The chemiluminescent ozone monitoring instruments have many advantages over previous colorimetric instruments, such as better sensitivity, specificity, and reaction times (instant reactions). (Author conclusions modified)

50795 **APTIC NO. 73005**

Ferrari, L. M.

MEASUREMENT OF GASEOUS AND PARTICULATE POLLUTANTS IN THE ATMOSPHERE. *Preprint, 29p., 1973. 6 refs. (Presented at the Instrumentation and Control of Effluents Symposium, Sydney, Australia, Oct. 10, 1973.)*

Methods for the automatic measurement of gaseous and particulate air pollutants are reviewed. Sulfur dioxide, nitrogen oxides, carbon monoxide, ozone, and hydrocarbons are discussed in relation to their measurement by such methods as conductimetric analysis, coulometry, colorimetry, flame photometry, amperometric analysis, remote ultraviolet detection, chemiluminescence, non-dipsersed infrared spectrophotometry, catalytic combustion analysis, and flame ionization detection. Measurement methods outlined for dusts and aerosols include: the use of deposit gauges, high volume sampling, coefficient of haze measurements, and nephelometry. Each method is described in terms of its principle of operation and its applicability to one or more of the above pollutants.

50796 **APTIC NO. 68588**

Fouche, Daniel G.

AIR POLLUTANT DETECTION BY RESONANCE RAMAN SCATTERING. *Preprint, 23p., 1973 (?). 15 refs.*

The use of resonance Raman scattering for the remote detection of air pollutants is discussed in relation to other light scattering techniques, with previous experiments involving ordinary Raman scattering, resonance Raman Scattering, resonance fluorescence, and broad fluorescence being cited in connection with observations of iodine vapor and nitrogen dioxide. The single-endedness advantage of ordinary Raman scattering does not degrade in going to resonance Raman scattering for increased sensitivity in remote detection, though the advantage of good depth resolution in ranging experiments does degrade as resonance is approached. The probability of absorption increases as resonance is approached, thereby increasing the amount of delayed scattering. The ability of ordinary Raman to monitor all pollutants simultaneously with a single laser wavelength also degrades with resonance Raman since by increasing the sensitivity for detecting other pollutants may be decreased. The advantage of arbitrary wavelength also disappears in going from Raman to resonance Raman scattering. Only sulfur dioxide, nitrogen dioxide, and ozone among the common air pollutant molecules have a significant amount of absorption in the region where the atmosphere is transparent; the cross sections of these three molecules may be enhanced by an ultraviolet laser line which would give better sensitivity in detecting pollutants by Raman scattering.

50797 **APTIC NO. 72949**

French, J. B., N. M. Reid, J. A. Buckley, and G. Marson

TRACE ATMOSPHERIC GAS ANALYSIS PROGRAM. *In: Continued Research on Plasma and Gas Dynamics, Energy, Aerodynamics, and Noise (Annual Progress Report). Toronto (Ontario), Inst. for Aerospace Studies, p. 90-92, 1973.*

NTIS: N74-23490

A multi-purpose trace atmospheric gas analyzer based on the mass spectrometric analysis of ions generated during ion-molecule reactions is described. A continuous stream of 5-100 l/min of outside or room air is drawn into a region where primary ion production occurs, followed by additional ion-molecule reactions and a set of stable end product ions. These ions are then concentrated and introduced into a vacuum chamber and are directed to a quadrupole mass spectrometer. Sensitivities in the parts per trillion range are demonstrable for trace gases like dimethylsulfoxide, propylamine, ammonia, and trinitrotoluene. The analyzer can also be used to detect trace amounts of organic compounds like amines, acetone, and alcohols in human breath for the diagnosis of metabolic disorders.

50798 **APTIC NO. 73161**

Gower, Donald E., Frank Buckman, Earl Goodwin, Daniel Halton, Dennis Humphris, and Robert Kerr

NEW YORK STATE PHOTOCHEMICAL OXIDANT STUDIES. *New York State Dept. of Environmental Conservation, Div. of Air Resources, Rept. BAQS 42, 56p., Jan. 1973. 5 refs.*

Parallel ambient air measurements using gas phase chemiluminescence ozone instrumentation and the older potassium iodide colorimetric technique resulted in chemiluminescence results that were two to 10 times higher than the KI results. Only 60% valid KI oxidant data were obtained after careful instrument redesign. Unless total oxidant and ozone instruments are operated in parallel, errors occurring in the total oxidants instrument are difficult to detect. The validation of existing health standards with the federal reference chemiluminescent ozone instrument is recommended. (Author summary modified)

50799 **APTIC NO. 73145**

Hebel, Kenneth G., Robert L. Protzmann, Richard Davis, and Richard Knarr

SULFU DIOXIDE AND SULFURIC ACID LIQUID PARTICULATE MEASUREMENT IN SULFURIC ACID PLANTS. *Preprint, Stauffer Chemical Co., Eastern and Western Research Centers, 48p., 1973 (?). 2 refs.*

Techniques for sampling and analyzing sulfur dioxide, sulfur trioxide, and sulfuric acid mist emissions from sulfuric acid plants wer aluated at various plant locations. Both the Andersen particle sizing sampler and the Brink mist sampler were tested for particle size distribution measurements ofH20 4mist, with the former device appearing to be more appropriate for H2SO4 plant analysis. A barium perchlorate/sulfonazo III colorimetric method and a lead perchlorate/lead specific-ion electrode analytical method were used to determine SO2, SO3, and H2SO4 as sulfate concentrations, and both methods were comparable. Each offered improved precision and accuracy over the Environmental Protection Agency-recommended thorin technique. Comparisons between the determination of SO2 by peroxide/volumetric and grab-sample/gas chromatographic methods revealed that the latter method is more rapid and easily performed, though more hardware is required to perform the analysis. (Author summary modified)

50800 **APTIC NO. 73158**

Ludwig, C. B., M. Griggs, W. Malkmus, and E. R. Bartle

AIR POLLUTION MEASUREMENTS FROM SATELLITES (CONTRACTOR REPORT). *General Dynamics Corp., San Diego, Calif., Convair Aerospace Div., National Aeronautics and Space Administration Contract NAS1-10466, Work Unit 160-44-64-01, Rept. GDCA-HAB-73-011, NASA CR-2324, 222p., Nov. 1973. 201 refs.*

Various types of active and passive remote sensing systems (via satellite) are discussed along with some preliminary calculations on their potential for measuring different air pollutants. Tropospheric carbon monoxide, carbon dioxide, sulfur dioxide, nitrogen dioxide, ammonia, formaldehyde, and methane appear capable of being measured by nadir looking passive systems. Additional species such as nitric oxide, nitric acid, ozone, and water may be measured in the stratosphere through a horizon experiment. A review of several techniques for measuring aerosols in a nadir looking experiment indicates that radiance measurements are the most promising for general global applications. A sun occultation technique also appears applicable to the measurement of stratospheric aerosol. Various instruments currently under development are described. (Author abstract modified)

50801 **APTIC NO. 69133**

Penney, C. M., W. W. Morey, R. L. St. Peters, S. D. Silverstein, M. Lapp, and D. R. White

STUDY OF RESONANCE LIGHT SCATTERING FOR REMOTE OPTICAL PROBING. *General Electric Corporate Research and Development, Schenectady, N. Y., National Aeronautics and Space Administration Contract NAS 1-11624, Rept. NASA CR-132363, SRO-73-125, 140p., Sept. 1973. 63 refs.*

NTIS: N74-20316

Enhanced scattering and fluorescence processes in the visible and ultraviolet regions were examined in relation to remote optical sensing of gases. The theoretical relationship between scattering and fluorescence from an isolated molecule was examined through analysis of the time dependence of re-emitted light following excitation by pulsed incident light. Argon and krypton lasers, single moded by a tilted etalon, and a 0.75 m double monochromator, were used to determine properties of the re-emission from nitrogen dioxide, iodine, and ozone excited by visible light. A narrow-line dye laser and a 0.75 m single monochromator were used to measure the absolute vibrational Raman scattering cross sections of nitrogen and oxygen at 300 nm and to examine the fluorescence from sulfur dioxide excited at various wavelengths near 300 nm. Both N2 and O2 cross sections were several times larger than predicted by extrapolation from the visible region. Sharp line fluorescence from SO2 in air near standard temperature and pressure was 10,000 times stronger than N2 vibrational Raman scattering. Remote, range resolved measurements that appear practical include: ambient SO2 and O3 in the lower atmosphere from the ground, O3 in the stratosphere from the ground, and numerous atomic species at altitudes above 50 km from satellite.

50802 **APTIC NO. 75263**

Rogozina, E. M. and L. F. Dikaya

ON THE QUESTION OF DETERMINING OXYGEN AND CARBON DIOXIDE IN THE AIR. *(K voprosu ob opredelenii kisloroda i uglekislogo gaza v vozdukhe). Gigiena i Sanit., 38(10):67-68, Oct. 1973. 2 refs. Translated from Russian, 3p.*

A gas chromatographic method for measuring oxygen and carbon dioxide in air is described. The method has accuracies of + or - 0.06 for CO2 and + or - 0.1 for O2. It was used to measure air samples with 10-21% oxygen and 0.1-6% CO2. Complete analysis, including air sampling, does not exceed 10 min. The method can be used to analyze air in industrial plants.

50803 **APTIC NO. 72975**

Schefer, R. W., R. D. Matthews, N. P. Cernansky, and R. F. Sawyer

MEASUREMENT OF NO AND NO2 IN COMBUSTION SYSTEMS. *Preprint, The Combustion Inst., Pittsburgh, Pa., Western States Section, 19p., 1973. 9 refs. (Presented at the Combustion Institute, Western States Section, Fall Meeting, El Segundo, Calif., 1973.)*

A premixed opposed jet stabilized flame and a simple turbulent diffusion flame were used to compare various nitric oxide and nitrogen dioxide sampling probes. Cooled and uncooled quartz or stainless steel probes with tips designed for aerodynamic quenching were used. Gas samples were analyzed with a chemiluminescent detector modified for measurement of total nitrogen oxides. No appreciable differences between any of the sampling probes were observed when measuring total NOx. Cooling configuration and flame system were critical, however, when measuring NO and NO2, and only cooled probes appeared adequate for quantifying NO and NO2 in combustion systems. Surprisingly large concentrations of NO2 were observed in both flame systems; NO2 comprised virtually 100% of the total NOx in the opposed jet stabilized flame system and as much as 40% in the fuel rich region of the turbulent diffusion flame. (Author summary modified)

50804 **APTIC NO. 70209**

Scheide, E. P., R. Alvarez, B. Greifer, E. E. Hughes, and J. K. Taylor

A MERCURY VAPOR GENERATION AND DILUTION SYSTEM (FINAL REPORT). *National Bureau of Standards, Washington, D. C., Dept. of Commerce, NBSIR 73-254, 11p., Oct. 1973.*

A system is described which is capable of producing well-defined test atmospheres of mercury in air or other diluent gases at concentrations between 0.005 and 0.5 micrograms/l an analytical system for the analysis of these gas mixtures is also described. Various parameters that affect the generator and analytical system and their interactions are discussed. This gas delivery system provides a means of calibration of the various analytical systems for mercury now in use. The analytical unit of the system can also be used for the determination of mercury in industrial atmospheres by collecting the mercury on a silver wool collector, and then desorbing it by heat into a flameless atomic absorption spectrometer. (Author abstract)

50805 **APTIC NO. 73032**

Schildkraut, E. R., J. Engel, and T. Hirschfeld

REMOTE DETECTION TECHNIQUES. *Society of Photo-optical Instrumentation Engineers, Redondo Beach, Calif., and Merrimack College, North Andover, Mass., Electro-Optics Principles and Applications Seminar Proceedings, Boston, Mass., 1973, vol. 38, p. 145-150. 8 refs. (April 30-May 1.)*

Advances in electro-optical devices used for remote sensing are reviewed. New high gain first dynode photomultiplier tubes that allows for resolution of 1, 2, 3, and 4 photon events within their 2 nanosecond response time enable photon counting to be performed within a single pulse of data return. Improved pockels cells for Q-switching lasers that utilize new krytron trigger circuitry permit about 1 nanosecond of jitter in typical time gating electronics. Better infrared detectors with improved frequency response increase the utility of infrared scanning instruments in field applications. The combination of digitized data, high gain photomultiplier tubes, and new variable storage displays with their increased writing rate and display brightness enable the production of a gain ranged display for remote point sampling instruments. Typical spectra obtained by remote Raman instrumentation and infrared instrumentation are illustrated for nitrogen dioxide, sulfur dioxide, and kerosene.

50806 **APTIC NO. 67166**

Straubel, H.

OBSERVATION OF WATER UPTAKE BY ALKALI SALTS. *(Beobachtung der Wasseraufnahme an Alkalisalzen). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 126-131. 4 refs. (Oct. 17-18.)*

An electromagnetic-photographic method for observation of water uptake by crystalline alkali salts such as sodium chloride and cobalt chloride is presented. The particles are suspended in a Millikan type plate condenser with three plates. The particle is suspended between two condenser plates carrying d.c. voltage, and stabilized laterally by a third plate carrying a.c. voltage. Thus, it is possible to determine the charge per mass ratio of the particle by varying either the d.c. or a.c. voltage. To determine the mass charging as a function of the water uptake from the charge per mass ratio determined by means of the three-plate condenser, the droplet diameter is determined from the diffraction pattern produced by means of laser beam on a film.

50807 **APTIC NO. 70415**

Uthe, Edward E. and Neil A. Shaw

A COMPARISON OF ATMOSPHERIC STRUCTURE AS OBSERVED WITH LIDAR AND ACOUSTIC SOUNDER TECHNIQUES. *Preprint, Stanford Research Inst., Menlo Park, Calif. and Argonne National Labs., Argonne, Ill., 4p., 1973 (?). (Presented at the Conference on Laser Radar Studies of the Atmosphere, Williamsburg, Va., June 4-6, 1973.)*

Preliminary data obtained from comparisons of lidar and acoustic sounder techniques for examining the atmospheric structure obtained during 1972 field programs of the Metropolitan Meteorological Experiment at St. Louis are presented. The lidar uses a Pockels cell Q-switched ruby laser capable of firing at 60 pulses/min with an energy output of approximately 1.0 joules/pulse; and the acoustic sounder emits sound pulses of approximately 100 milliseconds in duration at a frequency near 1000 Hz and a power of 100 wats (root mean square). The early morning mixing depth and its gradual increase by convection as determined from both data types are well correlated, though the sounder record does not give this information after 1230 central daylight time. The turbulent cells are easily identified on the lidar presentation (1330-1500 CDT), with wind speed and direction shifts being recorded on the lidar data as sudden decreases in the near surface aerosol concentrations and on the sounder data as sharp vertical discontinuities. A cellular- structured air parcel passing over the area between 1800 and 1900 CDT which caused a lift of the atmospheric layers is detected by both indirect sensors due to the introduction of short-period atmospheric waves. The sounder normally detects the reestablishment of the mixing layer before the lidar since particulate gradients normally result from a trapping of particles by thermally stable stratifications.

50808 **APTIC NO. 73470**

Vol berg, N. S. and E. D. Egorova

QUANTITATIVE DETERMINATION OF NITROGEN DIOXIDE IN AIR. DETERMINATION OF THE COEFFICIENT OF THE CONVERSION OF NITROGEN DIOXIDE INTO NITRITE ION. *(Opredelenie soderzhaniya dvuokisi azota v vozdukhe. Ustanovlenie koeffitsienta perekhoda dvuokisi azota v nitrit-ion). Text in*

Russian. Tr. Gl. Geofiz. Observ., no. 293:93-98, 1973. 5 refs

The coefficient of conversion of nitrogen dioxide into nitrate ion in potassium iodide solution was determined for the quantitative determination of NO2 in the air by the Griess-Ilosvay method. As opposed to the assumed 100% conversion of NO2, the actual coefficient of conversion was found to be 74%. The NO2 loss due to incomplete absorption in the potassium iodide solution amounted to about 1%.

50809 **APTIC NO. 73471**

ol berg, N. S. and T. A. Kuz mina

DETERMINATION OF HYDROGEN FLUORIDE IN ATMOSPHERE. *(Opredeleniye ftoristogo vodoroda v atmosfere s otborom prob na tverdyy sorbent). Text in Russian. Tr. Gl. Geofiz. Observ., no. 293:78-82, 1973. 9 refs.*

A method for sampling gaseous hydrogen fluoride on solid sorbent for subsequent photometric determination by the attenuation of the coloration of a zirconium-xylenol range complex is described. Glass granules of 1 to 2 mm in size, treated with 0.2% alcohol solution of potassium chloride, are used as solid sorbent either in a wet or dry state. The rate of sampling amounts to 3 l/min for up to 20 min for hydrogen fluoride concentrations not greater than 0.2 mg/cu m. The adsorbed hydrogen fluoride is quantitatively desorbed by a small amount of water. The solid sorbent is placed in a glass tube 5 mm in diameter.

50810 **APTIC NO. 73468**

Zaytsev, A. S.

ANALYSIS OF THE CHANGE OF THE SULFUR DIOXIDE CONCENTRATION STRUCTURE WITH TIME IN ATMOSPHERE. *(Rezul taty analiza vremennoy struktury kontsentratsiy sernistogo gaza v atmosfere). Text in Russian. Tr. Gl. Geofiz. Observ., no. 293:41-46, 1973. 6 refs.*

A mathematical method for the determination of the variation of sulfur dioxide concentrations in the air with time in a city with scattered emission sources is presented. Two different types of variations of the SO2 concentration levels during the winter period were distinguished: one type pertained to high concentrations of 0.1-0.2 mg/cu m which were more or less directly determined bby the actual emissions rather than by the meteorological conditions, while another type was characterized by low background levels of 0.05-0.1 mg/cu m which were determined by the meteorological conditions. The average SO2 level was lower in spring than in winter with values ranging from 0.03 to 0.07 mg/cu m. The results indicate that meteorological forecasts of the SO2 concentrations require monitoring times of 6 to 8 hr while general-purpose measurements give reliable values at monitoring times of 1 hr and longer.

1972

50811 **APTIC NO. 66753**

Blakeslee, H. William and Louis R. Reckner

ANALYTICAL TECHNIQUES IN AIR POLLUTION. *In: Air Pollution and Industry, R. D. Ross (ed.), New York, Van Nostrand Reinhold Co., 1972, Chapt. 5, p. 248-280. 30 refs.*

A review is presented on techniques for the sampling and analysis of air pollutants. The most common reaction for the noninstrumental detection of gaseous air pollutants is the colorimetric change which can be measured either visually or with a spectrometer. Dry chemical tests using indicating papers and tubes provide simple and rapid checks and are useful when the danger of toxic gases are present. The basic unit of the wet chemical air pollutant test is the absorption apparatus which may be either of the impinger type or the fritted glass scrubber, with the absorbed pollutants being subjected most often to colorimetric tests. The most basic form of instrumental techniques is also based on absorption, though in an automated manner, with the measurement often being done by a built-in colorimeter or conductivity cell. Such instruments are often used for monitoring sulfur dioxide, nitrogen oxides, ozone, chiorine, oxidants, cyanides, and sometimes carbon dioxide. Fluorides are better detected with fluorescence techniques as are nitrogen oxides. Hydrocarbons can be detected over a wide concentration range with a flame ionization detector. Air pollution instruments based on infrared spectrophotometry can be used for the measurement of CO2, carbon monoxide, SO2, O3, acetylene, ethylene, methane, ammonia, and peroxyacyl nitrates. Ultraviolet methods can be used for nitrogen dioxide, SO2, O3, and hydrocarbons. The gas chromatograph is one of the most versatile air pollution instruments and is able to separate complex mixtures. The mass spectrometer is capable of identifying small amounts of materials. Several instrumental techniques are also available for organic and inorganic particulate analysis. Odor threshold determinations can only be made by using the average reaction of a group of people.

1971

50812 **APTIC NO. 73017**

Chen, Sherman and Rob Griesbach

DETERMINATION OF ACID MIST AND ITS VAPOR OR GASES USING A PORTABLE SAMPLING TRAIN. PLUS ADDENDUM: MEASURING THE NITRIC ACID EMITTED FROM A NITRO-COTTON PLANT. *Explosives Research Lab., McMasterville (Quebec), Memorandum 147, 45p., Nov. 1971. 4 refs.*

A method of determining the concentrations of potential air pollutants in industrial stack gases is described. The sampling equipment consists of two portable wooden boxes, connected in series. Mist and/or dust particles are trapped in the first box, while in the second the vapor is absorbed. The device was used to measure sulfur acid mist, sulfur dioxide and sulfur trioxide gases, nitric mist, nitric acid vapor, and ammonium nitrate fumes. The device and analytical technique can give accurate mist loading data, mist particle size and vapor or gases composition with a reasonable expenditure of time. Details of the sampling equipment and analytical technique for H2SO4 mist and HNO3 mist and vapor from a nitro-cotton plant are described. (Author abstract modified)

50813 **APTIC NO. 70195**

Petrick, Dieter

MEASUREMENT OF CONCENTRATION OF COMBUSTIBLE GASES AND VAPOURS WITH AUTOMATIC ZERO AND SENSITIVITY ADJUSTMENT. *(Geraet zur Messung der Konzentration brennbarer Gase und Daempfe). Text in German. (Auergesellschaft GmbH, Berlin (Germany)) W. Ger. Pat. Appl. 1,965,804 4p., July 8, 1971. 3 refs. (10 claims).*

The device comprises bridge circuit consisting of a detector and compensating resistors and resistors to form the input to the operational amplifier. Spirals are exposed in a probe to a burning gas, one of which is made so that a catalytic combustion of the gas takes place on it, making it hotter than the other spiral with the result that there is a voltage output from the bridge which depends on the gas concentration. This is amplified by amplifiers the output of which is fed to an indicator. For automatic zero adjustment a pulse is fed into the input which sets a binary counter to zero and switches off all transistors. A flip-flop circuit opens a gate and the voltage of the comparator decreases, in steps, to zero. Thereafter, the comparator opens a gate and a counter switches on the transistors. A similar network operates the automatic sensitivity adjustment.

AIR QUALITY MEASUREMENTS

1975

50814 **APTIC NO. 71187**

Altshuller, A. P

ESTIMATION OF BACKGROUND PARAFFINIC HYDROCARBON CONCENTRATIONS IN URBAN AIR. *Preprint. Environmental Protection Agency, Research Triangle Park, N. C., 16p., 1975. 6 refs.*

The hydrocarbon concentration and composition of samples collected in Los Angeles and in the New York - New Jersey area were used to characterize the paraffinic fraction. Comparisons were made based on diurnal concentration curves for individual hydrocarbons, weekday to Sunday concentration ratios for various individual hydrocarbons and carbon monoxide, and differences in these characteristics of Los Angeles compared to the New York - New Jersey samples. A background of paraffinic hydrocarbons was computed which is attributed to natural gas losses and petroleum vapor seepage in the Los Angeles Basin. Similar backgrounds are likely to exist in other petroleum-producing areas. The potential for ozone formation from this background of hydrocarbons needs detailed assessment. (Author abstract modified)

50815 **APTIC NO. 73140**

Briehl, Daniel, Brian A. Ridley, Ernest Hilsenrath, and Harold I. Schiff

NITRIC OXIDE, WATER VAPOR, AND OZONE IN THE ATMOSPHERE AS MEASURED IN SITU FROM AN AIRCRAFT (TECHNICAL MEMORANDUM). *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, Work Unit 505-03, Rept. NASA TM X-3174, E-8077, 11p., Jan. 1975. 8 refs.*

In-situ measurements of atmospheric nitric oxide, water vapor, and ozone were made from aircraft flying between altitudes of 7.6 and 12.5 km in the maritime air between Hawaii and San Francisco and between Hawaii and 155 deg west, 35 deg north as part of an instrument evaluation pla for the National Aeronautics and Space Administration Global Atmospheric Sampling Program. Measurements of NO with a chemiluminescent instrument ranged between 0.05 ppb (at the limit of detectability) to 0.41 ppb (by volume). Water vapor, as measured by an aluminum oxide hygrometer, ranged from 5.2 micrograms/g to saturation. Ultraviolet absorption measurements of O3 ranged up to 235 ppb (by volume). All of the constituents showed considerable spatial and day-to-day variation in concentration. Typical temporal plots of the concentrations obtained are illustrated. (Author abstract modified)

50816 **APTIC NO. 70577**

Lahmann, E. and K. -E. Prescher

RESULTS OF IMMISSION MEASUREMENTS OF THE OXIDES OF NITROGEN IN BERLIN. *(Ergebnisse von Stickoxid-Immissionsmessungen in Berlin). Text in German. Gesundh. Ingr., 95(1):1-4, 1975. 21 refs.*

Automatic measurements of the oxides of nitrogen immission concentrations were taken between July 1973 and June 1974 in Berlin-Steglitz. Within the same period of time manual measurements by the Saltzman method were taken in Berlin- Tempelhof, Berlin-Neukoelln and again in Berlin-Steglitz. The sampling time in each case was 30 min. The average half-hourly concentration was 0.13 mg NOx/cu m, the 95% value of the cumulative frequency distribution was 0.36 mg NOx/cu m. The maximum concentration over 30 minutes was 0.79 mg NOx/cu m, over one day 0.42 mg NOx/cu m, and over 1 mo 0.26 mg NOx/cu m. Since in Berlin-Steglitz sulfur dioxide and carbon monoxide immission measurements were taken at the same time the correlations between the various immissions were determined. The following correlation coefficients were calculated: for NOx/SO2 0.58, for NOx/CO 0.76, and for SO2/CO 0.41. A tabular survey of NOx immission measurements taken in other West German cities is given. For example NOx in Munich has been measured by the photometric Saltzman method over the period 1967-1973. At 69 points 12 to 18 random samples were taken per year. The annual averages fluctuated between 0.03 and 0.38 ppm NOx.

50817 **APTIC NO. 73128**

Volchok, H. L., L. Toonkel, and M. Schonberg

RADIONUCLIDES AND LEAD IN SURFACE AIR. *In: Appendix to Health and Safety Laboratory Environmental Quarterly. Energy Research and Development Administration, New York, Health and Safety Lab., UC-11, p. B1-B9 and B122-B130, April 1, 1975. 8 refs.*

NTIS: HASL-291 Appendix

Surface air concentrations of stable lead and radionuclides measured over the period October 1966 to June 1974 are compiled. Results are reported for 23 land and ocean sites throughout the world on a monthly basis. Special attention is given to strontium-90, the plutonium isotopes, and lead-210 because of their usefulness as atmospheric tracers and their potential relation to health effects.

1974

50818 **APTIC NO. 70647**

Birrer, W. M.

SOME CRITICAL REMARKS ON TREND ANALYSIS OF TOTAL OZONE DATA. *Pure Appl. Geophys. (Basel), 112(3):523-532, 1974. 3 refs.*

A 45-year series of total ozone observations at Arosa, Switzerland was used to study the significance of atmospheric ozone trend analysis. All measurements and calculations from 1926-1971 were reduced to the actual absorption coefficients so that the ozone data were homogeneous and comparable. Seasonal changes were eliminated by computing for each month the difference between its mean value of total ozone and the monthly normals. Ozone trend lines were fitted to the differences using a least-square method. Apparent periodic or quasiperiodic variations in the maount of total ozone posed great uncertainties in trend analyses of world-wide ozone increases or decreases. High positive trends alternating with high negative ones appeared throughout the observational series, and small variations in the period length were capable of changing the sign of the trend. Since the trend values decreased with increasing period length, periods of 5-10 yr were too short to make any statements about future ozone levels. Caps in the world-wide observational network and the existence of persistent large-scale flow patterns suggested that even a mean trend value from all stations of a monitoring network will be questionable

50819 **APTIC NO. 73479**

Casteran, Lucien, Jeanne Duffaud, and Christian Wager

OPERATION CARBON MONOXIDE. *(Operation Monoxyde de Carbon) Text in French. In: Etudes de pollution atmospherique a Paris et dans les departements peripheriques en 1973. Prefecture de Police, Paris (France), Laboratoire Central, 12p., June 1974.*

Results of systematic non-dispersive infrared analyses of carbon monoxide in and around Paris in 1973 are presented. The daily variation of the CO concentrations was determined by that of the traffic density, with the maximum during the morning and evening rush hours. The evening maxima were more pronounced than the early ones. Also, the CO concentrations were considerably higher on workdays than during weekends and holidays. The California standard of 40 ppm as an hourly mean was exceeded 0.8% of the time throughout the year. The CO concentration levels have shown a significant overall increase for the entire Paris region, and for all but 2 of the 6 sampling stations.

50820 **APTIC NO. 70758**

Dixit, S. C. N., J. Alste, and J. Bagg

MEASUREMENTS OF AIRBORNE PARTICULATES IN THE MELBOURNE URBAN REGION. *Clean Air (J. Clean Air Soc. Australia New Zealand), 8(3):53-58, Aug. 1974. 27 refs.*

Total suspended particulates sampled from seven urban locations and one rural location in the Melbourne, Australia area were analyzed in terms of concentration and chemical composition for lead, sulfate, nitrate, and benzene-soluble fraction. Mean total suspended particulate concentrations ranged from 26.0-87.0 micrograms/cu m for the urban locations as compared with 25.0 micrograms/cu m for the rural location. Urban mean lead values ranged from 0.5-0.9 micrograms/cu m, whereas the rural mean lead value was only 0.1 microgram/cu m. Mean sulfate values were 1.9-4.4 micrograms/cu m for the urban locations and 1.4 micrograms/cu m for the urban locations. Mean urban nitrates ranged from 0.03-0.09 micrograms/cu m as compared with a mean rural value of 0.02 microgram/cu m. Benzene-soluble matter as a percentage of total suspended particulates ranged from 4.6-11.7% at the urban locations in comparison to a rural value of 8.6%. With the exception of lead, the compositions of urban and rural suspended particulates were similar. Total suspended particulate concentrations increased with decreasing rainfall, ranging from 44 micrograms/cu m (October monthly mean for all locations) with 79.4 mm rainfall to 69.8 micrograms/cu m (December monthly mean for all locations) with a rainfall of less than 2.0 mm. The median total suspended particulate level in the Melbourne atmosphere was lower than that of other major cities outside Australia. Sulfate and nitrate levels were considerably lower than those for some cities in the United States.

50821 **APTIC NO. 73482**

Favart, Michel and Jeanne Duffaud

OPERATION LEAD. *(Operation Plomb). Text in French. In: Etudes de pollution atmospherique a Paris et dans les departements peripheriques en 1973. Prefecture de Police, Paris (France), Laboratoire Central, 10p., June 1974.*

Results of systematic measurements of lead concentrations in the air of Paris in 1973 are presented. The samplings were carried out at altitudes of 1.7, 3, and 12 m. The lead concentrations were slightly lower than in 1971 and 1972. The monthly means were consistently below 5 micrograms/cu m, while the diurnal means never reached the 8 micrograms/cu m level. The yearly mean was highest with 2.4-3 micrograms/cu m for sites with the highest traffic density. The lead concentrations were lowest during the vacation season. The lead concentration was highest in air samples taken at 1.7 m altitude, and the concentration dropped by a factor of 2 from 3 m to 12 m altitude. Close correlation was established between the lead and carbon monoxide concentrations, and between the lead and oxides of nitrogen concentrations.

50822 **APTIC NO. 73171**

Fontanella, Jean-Claude, Andre Girard, Louis Gramont, and Nicole Louisnard

ANALYSIS OF STRATOSPHERIC SPECTRA OF NITROGEN DIOXIDE AND NITRIC ACID. *(Analyse de spectres stratospheriques de NO2 et HNO3). Text in French. CR Acad. (Paris), Ser. B, 278(22):995-998, May 1974. 7 refs.*

Absorption spectra of nitrogen dioxide and nitric acid were measured on board a Concorde 001 at 15.5 km altitude. The local concentration of NO2 determined from the absorption spectra was 1,400,000,000 + or - 500,000,000 mol/cu cm. The NO2 concentration was fairly constant up to 25 km altitude with values between 1,000,000,000 and 2,000,000,000 mol/cu cm. The nitric acid concentration, determined by simulation of the spectra obtained in the laboratory, using different concentrations of this substance in the same cuvette as used at altitude, was 10,000,000,000 + or - 3,000,000,000 mol/cu cm. A sharp decrease in the nitric acid concentration between 20 and 15 km, and the existence of a concentration maximum around 20 km altitude, were established.

50823 **APTIC NO. 70685**

Inoue, Yasuko, Koji Abe, Hidehiko Hoshikawa, and Toshihiko Seki

INVESTIGATION AND STUDY OF AIR POLLUTION (REPORT NO. 12): SUSPENDED PARTICULATE MEASUREMENT BY HI VOLUME AIR SAMPLER (WITH SHELTER) AND THE COMPOSITION ANALYSIS (1971-1972). *(Taiki osen ni kansuru chosa kenkyu (dai-12 ho), Hi Volume Air Sampler-ho (sheruta-tsuki) ni yoru fuyu funjinryo to sono ganyu seibun ni tsuite (Showa 46-nen-47 nen). Text in Japanese. Senda-shi Eisei Shikenshoho (Sendai Munic. Rep. Inst. Pub. Health), no. 4: 76-85, Oct. 1974.*

The results of the 1971 and 1972 monitoring of suspended particulates and their content in Sendai are reported. The high-vol samplers were dried for 4 hours at 60 C, weighed, and the weight differences before and after and the volume of air sampled were used for obtaining concentration. The material was analyzed partially for tar, metal, and nonmetal elements (sulfates and nitrates). The amount of suspended particulates was 471-76 micrograms/cu m in 1971 and 263-74 in 1972. The annual averages were 185 micrograms and 152 micrograms; seasonal averages were 244 in the spring, 116 in summer, 255 in fall, and 148 in winter for 1971 and 175, 140, 158, and 140 for 1972, respectively. The tar content was 90.5-6.9 micrograms/cu m, in 1971 with the yearly average of 22.9, the content in the summer was 1/2 to 1/3 of other seasons. The content in suspended particulates ranged between 26.6 and 3.7% and was higher in fall and winter. The tar content in 1972 was 83.8-7.9 micrograms. The level of SO4 ion was 7.2-0.5 micrograms/cu m in 1971 and 24.8-4.2 in 1972. The seasonal mean values were high in spring and winter, low in summer and fall. The NO3 content was 7.2-0.5 micrograms/cu m in 1971 and 9.4-0.8 micrograms/cu m in 1972. All lead, zinc, iron, and manganese contents were high in fall and varied in in other seasons.

50824 **APTIC NO. 68692**

Ito, Noriyoshi

INVESTIGATION ON THE AIR COMPONENT DISTRIBUTION PATTERN BY ENVIRONMENTAL SEGMENTS. *(Kankyo kubunbetsu taikichu shoseibun no bunryo ni kansuru chosa). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 2:116-131, March 1974.*

Part of the Shima Peninsula National Park was chosen as a relatively unpolluted area, and pollutants in the air were measured. Sulfur dioxide gas and dusts were measured by intermittent electroconductivity light and scattering; nitrogen oxides were measured by an intermittent automatic meter with the Saltzman reagent; oxidants were measured by neutral potassium iodide spectrometry; ozone was measured by a chemiluminescent automatic meter; hydrocarbons were measured by a flame ionization detector; and carbon monoxide was measured by an automatic CO meter. In addition, some manual analyses were conducted for time belt measurements. The investigation was carried out between Jan. 16 and 25, 1973. The average measurements were: 13 ppb for SO2; 20 micrograms/cu m for dusts; 7 ppb for nitric oxide; 19 ppb for nitrogen dioxide; 41 ppb for oxidants; and 36 ppb for O3. The period of investigation was short, sampling points were limited, and accurate evaluation of data was difficult. Generally, the pollutant measurements were relatively high, especially in north to north-northeast winds. Both oxidant and ozone concentrations were relatively high in similar patterns. A reverse correlation was noted between NO2 and oxidant-ozone concentrations.

50825 **APTIC NO. 70566**

Iwamoto, Kumejiro, Mikio Araki, and Toshio Uehara

THE CONCENTRATION OF SULFUR DIOXIDE IN INDOOR AIR BY CONDUCTOMETRIC METHOD. *(Shitsunai ni okeru SO2 sokutei no hoho to kekka). Text in Japanese. Kuki Seijo (Clean Air, J. Japan Air Cleaning Assoc., Tokyo), 12(2):51-59, July 1974. 4 refs.*

To examine the indoor sulfur oxide level and attendant problems of measurement, electroconductivity was applied to the sample air of various offices. The indoor air factors are many, one of which is the human body; for instance, an adult male emits 297 mg of ammonia, 278 mg of carbon monoxide (if a nonsmoker) or 417 mg (if a smoker), 504 mg of hydrocarbons, 0.6 mg of aldehydes, 232 mg of ketones, 5 mg of mercaptans and hydrogen sulfide, and 89 mg of aliphatic acid within 24 hours. Measurements of NH3 were taken by the ion electrode method in various offices, and the range was found to be 0.0212 to 0.174 ppm. In all cases, the measurements during the day were higher than those in the evening, and there was a correlation between human activities and the ammonia level in the air. An experiment with an oxalic acid crystal column showed that the sulfur dioxide measurement received no influence from ammonia if th ammonia level was within 4 ppm. An oxalic acid crystal column was used for removing interference by ammonia, and the SO2 levels of various buildings were taken. Four electroconductive automatic SO2 meters were used. In all buildings tested, air conditioning and various types of filters for harmful gases were used, and generally the SO2 in the indoor air level was 30 to 42% lower than that of outside air. But the level of the SO2 concentration in the outside air definitely influenced the concentration in the indoor air. In one of the builings, the SO2 level was about 50% of the outside air level; whether this was because the main conditioner utilized an activated carbon filter or due to any other factor was not clear.

50826 **APTIC NO. 70496**

Kasuya, Mitsuo

AIR POLLUTION CONDITIONS IN 1972. *(1972 nen no taiki osen jokyo ni tsuite). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo. (Air Pollut. Weather Forecasting data), no. 15:99-103, Feb. 1974.*

Air pollution data in the areas west of Kanto on the side of the Pacific ocean are given. Warnings of air pollution occurred only in large industrial cities during 1972. Air pollution by sulfur dioxide in large cities was reduced, but the problem became more serious in a wider area, compared to the previous years. In Tokyo, the localized high air pollution was due to heating systems of large buildings, while air pollution in Kawasaki was due to small plants. This localized pollution showed a trend of increasing concentration when two inversion layers existed at 200 to 300 m and 300 to 500 m, respectively, with wind velocity below 3 m/sec. Warnings of photochemical smog increased significantly from 1970 to 1972. From April to October, 1972, there were 33 warnings in Tokyo, 31 in Kanagawa, 21 in Chiba, and 19 in Hyogo. In the same period of time, there were 8437 injuries in Tokyo, 5726 in Saitama, and 1383 injuries in Kanagawa. Most of the injuries were of students in the cities. The highest oxidant concentration was 0.32 ppm at 2:00 pm on June 11 at Takatsu of Kawasaki city.

50827 **APTIC NO. 70217**

King, Robert B., J. Stuart Fordyce, Albert C. Antoine, Harold F. Leibecki, Harold N. Neustadter, Steven M. Sidik, John C. Burr, George T. Craig, and C. Lawrence Cornett

PRELIMINARY ANALYSIS OF AN EXTENSIVE ONE YEAR SURVEY OF TRACE ELEMENTS AND COMPOUNDS IN THE SUSPENDED PARTICULATE MATTER IN CLEVELAND, OHIO. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center; Ohio Environmental Protection Agency, Columbus, Ohio, and Div. of Air Pollution Control, Cleveland, Ohio, NASA-TM-X-71586, 3p., 1974. (Presented at the Earth Environmental Resources Conference, Philadelphia, Pa., Aug. 10-12, 1974.)*

The results of a reaserch program on the trace element and compound concentrations in ambient suspended particulate matter in Cleveland Ohio are presented as a function of source, monitoring location, and meterorological conditions. The major objectives of the study were to determine the ambient concentrations at representative urban sites and to develop a technique using trace element and compound data in conjunction with meteorological conditions to identify specific pollution sources which could be developed into a practical system that could be readily utilized by an enforcement agency. The network of 16 monitoring stations, annual means of 18 elements for Cleveland and several other cities, the network of seven monitoring sites in the suburbs west of Cleveland, average bromine to lead ratio, use of trace elements for source detection, concentration roses for antimony, comparisons of cadmium and antimony, and other results are mentioned.

50828 **APTIC NO. 70501**

Kumagai, Mamoru

TIME VARIATION OF AIR POLLUTION IN UNDERGROUND ARCADES AND BUILDINGS. *(Chikagai, biru no kuki osen no keijiteki henka). Text in Japanese. Preprint, Japanese Society of Public Health, Fukushima, p. 398, 1974. (Presented at the Japanese Society of Public Health Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 528.)*

The time variation of air pollution in underground arcades and buildings was studied for nine days in April 1973. Measurements were made on concentrations of sulfur dioxide, carbon monoxide, carbon dioxide and airborne particulates. In underground arcades, the SO2 concentration was directly influenced by SO2 concentration above ground when shutters to the outside were open. In buildings, SO2 concentration was below 0.02 ppm. Concentrations of CO, CO2, and airborne dust were consistently high, and indicate the presence of ventilation problems.

50829 **APTIC NO. 70331**

Matsuo, Kiyoko

THE BASIC INVESTIGATION OF AIR POLLUTION IN WAKAYAMA. *(Wakayama no taiki osen kiso chosa). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), no. 15-2:17-27, Feb. 1974.*

Since the installation of a telemeter system at 10 stations in April 1971, the pollution data in Wakayama have been continuously monitored. The minimum visibility in 1962-1964 was approximately 2.5 times higher than that in Osaka. The number of foggy days in the 1920s and 1930s were proportional to the number of factories, while no such relationships were found in the 1960s. The number of foggy days is now increasing rapidly. The relationships between the high sulfur dioxide concentration and wind direction and wind velocity were analyzed, indicating the effect of the location of pollutant sources. As a whole, the SO2 concentration showed a decreasing tendency reflecting the control measures taken by the industries. The pollutant concentration data of Wakayama were compared with those of Osaka in regard to the pressure pattern, high and low pressure fronts, inversion layer, wind direction and wind velocity. The variation in dust concentration showed a generally decreasing trend; however, at some locations, high concentrations were measured in 1971, probably because of the increased traffic volume at the Kinokawa by-pass.

50830 **APTIC NO. 73484**

Mauron, Bernard

OPERATION UNDERGROUND STRUCTURES. *(Operation Ouvrages Souterrains). Text in French. In*

Etudes de pollution atmospherique a Paris et dans les departements peripheriques en 1973. Prefecture de Police, Paris (France) Laboratoire Central, 4p., June 1974.

Results of systematic carbon monoxide concentration measurements in 26 underground parking lots in Paris are presented. The maximum allowable concentration of 100 ppm for 20-minute periods was exceeded 1% of the time in 8 units, i.e., in 31% of all cases. These percentages were 37% in 1972, and 57% in 1972 and 1971. The 50 ppm limit was not exceeded in any of the 8-hour periods between 8 am and 4 pm and between noon and 8 pm.

50831 **APTIC NO. 70517**

Morita, Masatoshi, Hideichi Mimura, and Tsuneyuki Nishizawa

ENVIRONMENTAL POLLUTION BY P-DICHLOROBENZENE. *(p-Jikurorubenzen ni yoru kankyo osen). Text in Japanese. Preprint, Japanese Society of Public Health, Fukushima, p. 311 1974. (Presented at the Japanese Society of Public Health Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 425.)*

The presence of p-dichlorobenzene (p-DCB) in water and air samples was ascertained by gas chromatogram, mass spectrogram, and fragmentgram. Water samples came from river and faucet water, while air samples consisted of outdoor and indoor matter. The extent of water pollution was much lower than that of air pollution, although p-DCB was found in fish in trace amounts.

50832 **APTIC NO. 73159**

Rosenberg, Norman J. and Shashi B. Verma

TERRESTRIAL SOURCE AND SINK STRENGTHS FOR ATMOSPHERIC CARBON DIOXIDE IN AN AGRICULTURAL REGION. *Nebraska Univ., Lincoln, Dept. of Horticulture and Forestry, National Oceanic and Atmospheric Administration Contract NOAA 2-35385, Rept. NOAA-74060508, 73p., April 1974. 35 refs.*

NTIS: COM-74-11304

Measurements of carbon dioxide concentration and flux in an agricultural region are presented along with the possible application of CO2 micrometeorology to studies of atmospheric pollution and turbulent transport. Infrared measurements of CO2 were made at sufficient height (concentration at 16 m and flux between 16 and 5.6 m) over Mead, Nebraska so as to represent an integration of CO2 fixation and release due to all types of land use in the region. Minimum daytime CO2 concentrations ranged from 295-309 ppm in late July to early August (time of apparent maximum photosynthetic activity) to 328-332 ppm in the winter. The peak daytime flux of CO2 from the atmosphere to ground ranged from 0.5-2.0 times 10 to the -7 g/sq cm/sec between June and September. Under stable stratified conditions, the atmospheric CO2 concentration and its vertical profiles were closely related to the concurrent Richardson number.

50833 **APTIC NO. 71161**

Rowland, F. S. and Mario J. Molina

CHLOROFLUOROMETHANES IN THE ENVIRONMENT. *In: Fluorocarbons - Impact on Health and Environment. 93rd Congress (House of Representatives), Second Session, Rept. H.R. 17577, H.R. 17545, Serial 93-110, p. 47-208, Dec. 11-12, 1974. 103 refs. (Hearings Before the Subcommittee on Public Health and Environment of the Committee on Interstate and Foreign Commerce.)*

GPO

Tropospheric concentrations of chlorofluoromethanes are reviewed and their reactions in the stratosphere are described. The mixing ratio of fluorotrichloromethane for the Atlantic Ocean surface air varied from 4 to 8 times 10 to the -11th power with a marked northern/southern hemisphere variation. Mixing ratios in southern California varied from 1.0 to 220 times 10 to the -11th power, as did mixing ratios for dichlorodifluoromethane of 30 to 800 times 10 to the -11th power. Concentrations of 9.7 times 10th to the -11th power for CFCl3 and 70 times 10 to the -11th power for CF2Cl2 were measured in the Anza Borrego desert. Estimates for the worldwide industrial production of chlorofluoromethanes are tabulated for 1950-1973. Atmospheric residence times were calculated for chlorofluoromethanes based on varying average lifetimes.

50834 **APTIC NO. 70321**

Sato, Shizuo

ATMOSPHERIC NITROGEN OXIDES CONCENTRATION IN TOMEI HIGHWAY. *(Kosoku doro shuhen chiiki ni okeru taiki-chu chisso sankabutsu nodo). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):496, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Nov. 6-8, 1974, Chiba, Japan, Paper 342.)*

The atmospheric nitrogen oxides concentration in the vicinity of Tomei highway was measured at six locations from Jan. 29 to Jan. 31, 1974. The 1-hour values of nitric oxide and nitrogen dioxide were measured by manual analysis (Saltzman method) and automatic analyzer (chemiluminescence and Saltzman method). The NOx concentration was greatly influenced by wind velocity. The highest concentrations measured were 28.1 pphm for NO and 7.3 pphm for NO2. The daily average concentrations of NOx at six locations were 1.7-14.9 pphm for Jan. 29, 2.7-18.1 pphm for Jan. 30 and 3.5-18.0 for Jan. 31. The NOx concentration decreased with the increase in distance from the highway; however, its effect was evident even at 500 m. The ratio of NO2 in NOx (NO + NO2) increased with the increase in distance from the highway.

50835 **APTIC NO. 70587**

Sato, Yasuhito, Isao Mizoguchi, Kuniyoshi Makino, and Hiroshi Yagyu

ON THE CORRELATION BETWEEN LIGHT CHLORINATED HYDROCARBONS AND OTHER POLLUTANTS IN TOKYO ATMOSPHERE. *(Tonai taikichu no tankasuiso oyobi ensokei yukiyozai to hokano osen bushitsu tono sokan). Text in Japanese. Tokyo-Toritsu Eisei Kenkyusho Kenkyu Nenpo (Annu. Rept. Tokyo Metrop Lab. Public Health), no. 25:371-379, Aug. 1974. 11 refs.*

Individual hydrocarbons were sampled at four points in Tokyo during the summer of 1973 and 1974. The air sample is collected by concentration using liquid oxygen, and analyzed by a gas chromatography-mass spectrometry combination. The GC is equipped with a flame ionization detector. A 3-meter glass column of 25% tricresyl phosphate on a chromsor W substrate was used. The column temperature was 40 to 100 C. Thirty-two were identified from most of sampling points. Seventy to 80% of the total hydrocarbons consisted of C1 through C3 (max up to 649 ppb). At some sampling stations, the toluene concentration was extremely high (max up to 410 ppb), and was attibuted to the traffic pattern. Several chlorinated hydrocarbons such as trichloroethane, trichlorethylene, dichlorethane, and perchloroethylene were also identified; however, neither methyl nitrate nor acrolein could be identified by the present method. A correlation analysis of individual pollutant was attempted. There was a clear correlation among paraffinic hydrocarbons, but chlorinated hydrocarbons had no correlation with other pollutants, indicating that the chlorinated hydrocarbons were emitted from different pollution sources.

50836 **APTIC NO. 70326**

Starkey, Roanld and James Warpinski

SIZE DISTRIBUTION OF PARTICULATE BENZO(A)PYRENE. *J. Environ. Health, 36(5):503-505, March/April 1974. 19 refs.*

Atmospheric particulate samples from eight impactor runs in downtown Green Bay during the winter of 1971-1972 were fluorometrically analyzed for benzo(a)pyrene concentration as a function of particulate size range. The carcinogen was not concentrated on any particular size range over particle diameters ranging from 0.01 to greater than 7.0 micron in contrast to previous studies reported for the size distribution of airborne particulates containing BaP. The mean BaP level was 9.82 micrograms/1000 cu m. Approximately 40% of the BaP was associated with the respirable size range (less than 2 microns diameter). The percent of BaP closely paralleled the percent of total particulates for the size ranges 0.01-1.1, 1.1-2.0, 2.0-3.3, 3.3-7.0, and greater than 7.0 micron. The mean BaP concentrations for these size increments ranged from 83-170 micrograms/g particulate. The size ranges were not exclusive of some overlap, and the possibility existed that small particles may have aggregated into larger ones. Also, other seasons may exhibit different particle size distributions and different BaP levels.

50837 **APTIC NO. 70692**

Takeuchi, Kozo, Shigeo Okamoto, and Yoshiko Emoto

THE SEASONAL VARIATION OF METALLIC CONTENTS IN SUSPENDED PARTICULATE MATTER OF INDOOR AIR. *(Shitsunai fuyu funjinchu no kinzoku seibun ni tsuite). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 12(2):33-42, July 1974. 2 refs.*

The indoor air pollution levels of suspended particulates were measured in buildings and outdoors in central Tokyo. Comparisons were made for the four seasons covering March 1972 through January 1973, and the metallic compositions were analyzed for calcium, magnesium, iron, zinc, manganese, cobalt, lead, cadmium, nickel, and copper by atomic absorption spectrophotometry. The measurement locations were: an office with natural ventilation; an office with central air conditioning; a department store with central air conditioning; and outside air on the rooftop. Both a low vol sampler and a high vol sampler were used for 8 consecutive hours for daytime and 16 consecutive hours at night. The ratio of hi-vol and low-vol dust collections was about 2 to 1, and the correlation coefficient was 0.961. Regardless of the air conditioning system, the amounts of suspended particulates during the day in buildings were higher than the level in the outdoor air. The level of particulates was about twice as high in an office with natural ventilation as outdoors and 1.5 times higher in an office with central air conditioning as outdoors. At night, the difference between inside and outside was much smaller in all cases. Seasonally, the pollution level in the department store in the fall was much less than the offices. The metal content in the indoor air samples ranged from 3 to 12%, but calcium, iron, zinc, and magnesium consisted of 80 to 90% of the total metal content. In the department store, the level of suspended particulates was relatively low throughout the year, but the ratio of metals was relatively high.

50838 **APTIC NO. 70554**

Waibel, M. and H. U. Wanner

SUSPENDED PARTICULATE MATTER AND BENZO-(A)PYRENE IMMISSIONS. *Experientia, 30(11):1359-1362, 1974. 8 refs.*

Measurements of particulate matter immissions (ground level emissions) and benzo(a)pyrene were carried out at six measuring points in and around Zurich in 1971/1972. The measuring points were in industrial, heavy traffic, residential, and recreation areas. The hygienic aspects of particulate matter and benzo(a)pyrene are generally reviewed, and the results of the Zurich measurements are presented. The yearly mean values for particulate matter concentrations were highest at congested squares; the industrial zone and the old town residential areas were in the intermediate position; and the more modern residential area and the recreation area had the lowest values. The yearly mean values for benzo(a)pyrene were similarly proportioned, except for those at the old town area where the benzo(a)pyrene content was increased. The monthly mean values showed higher particulate and benzo(a)pyrene contents in winter than in summer. Particulate matter concentrations were about 2.5 times higher in winter than in summer, and the benzo(a)pyrene concentrations were about 5.0 times higher. This was due to emissions from heating installations. The influence of atmospheric conditions was also noted. With greater wind speed and atmospheric precipitation, pollutant concentrations decreased. Immissions increased greatly during inversions. The lower the air temperature, the greater the immissions. Comparison of Zurich results with those from other countries and consideration of epidemiological studies from other countries revealed that Zurich particulate matter and benzo(a)pyrene concentrations were high enough to cause health injuries. Therefore, it will be necessary to reduce emissions by means of well-planned measures.

50839 **APTIC NO. 70317**

Yabuki, K., Y. Suzuki, and S. Kawagishi

ON AIR POLLUTANTS IN AND AROUND ROADS. *(Doro shuhen ni okeru taiki osenshitsu no dotai ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):490, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Nov. 6-8, 1974, Chiba, Japan, Paper 336.)*

The increase in traffic volume is one of the contributing factors of air pollution. The pollution at roadside of the Osaka beltway, Rt. 310, Rt. 21, a littoral industrial highway and some suburban roads was surveyed. The concentrations of oxidant, nitrogen dioxide, and sulfur dioxide were measured using a mobile measuring station while cruising or at rest during the period of May to Dec. 1973 and July to Aug. 1974. The results are analyzed with data obtained on Aug. 10 and 14, 1974 as examples. The variations in pollutant concentrations were evaluated in relation to the traffic volume, and a definite correlation was found. The NO2 concentration varied from 0.03 ppm at a suburban road to 0.1 ppm at the beltway, while ozone concentration decreased from 0.15 ppm at the suburban road to 0.01 ppm at the beltway. The ozone concentration decreased exponentially with the increase in traffic volume, which was attributable to the reaction of O3 and nitric oxide in automotive exhaust gas producing NO2.

50840 **APTIC NO. 70316**

Yamate, Noboru and Toshiro Matsumura

SUMMARY OF AIR POLLUTANTS LEVELS DURING THE PAST TEN YEARS (1964-1973) AT THREE AIR MONITORING STATIONS IN TOKYO. *(Junenkan (1964-1973) ni okeru Tokyo tonai sanchiten no taiki osen sokutei kekka no gaiyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):489, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Nov. 6-8, 1974, Chiba, Japan, Paper 335.)*

To investigate the status of air pollution due to automotive exhaust gas, the concentrations of carbon monoxide, sulfur dioxide, nitrogen dioxide, nitric oxide, dust, formaldehyde, hydrocarbons and oxidant were measured at three locations in Tokyo from Jan. 1964 to Dec. 1973. The CO and SO2 showed a generally decreasing trend, NO, dust, HC and oxidant remained unchanged, and NO2 showed an increasing trend. The average one-hour values (ppm) were 4.5 for CO, 0.053 for SO2, 0.030 for NO2, 0.060 for NO, 257 micrograms/cu m for dust, 0.008 for HCHO, 1.06 for HC and 0.033 for oxidant. The maximum yearly, monthly, daily and hourly averages (ppm) were 8.3,11.0, 19.3 and 50 for CO, 0.090, 0.140, 0.430 and 0.60 for SO2, 0.066, 0.080, 0.151 and 0.35 for NO2, 0.106, 0.188, 0.473, and 0.70 for NO, 641, 971, 2630 and 7273 micrograms/cu m for dust, 0.0105, 0.019, 0.028 and 0.073 for HCHO, 1.19, 1.48, 2.48 and 7.0 for HC and 0.37, 0.48, 0.124 and 0.314 for oxidant respectively.

50841 **APTIC NO. 69036**

Ibaraki Prefectural Government (Japan), Air Quality Division

WHITE PAPER ON THE ENVIRONMENT, 1973. *(Kankyu hakusho). Text in Japanese. 322p., March 1974.*

In 1972, the rate of passing the new environmental standard at the 10 monitoring stations of the Kashima area was between 17.2% and 100%; there were only two cases of more than 0.04 ppm concentration continuing for two or more days. In other areas of the Prefecture, the environmental sulfur oxide concentration by the lead dioxide measurement method ranged between 0.09 mg/day/100 sq cm, and 0.45 mg/day/100 sq cm. The suspended particulates annual average in the Hitachi area was 0.02-0.03 mg, and in the Kashima area, 0.02-0.06 mg according to digital dust counter measurements. The settling particle concentrations were decreasing; in the Hitachi area, the total average was 6.9 tons/sq km/mo, with one area reaching an extremely high level of 16.90 tons/sq km/mo. But the figures were 24 and 25 tons in 1970 and 1971. In the Kashima area, the 1972 average was 9.99 tons, with the maximum of 27 tons; the 1973 average between April and October was 10.07 tons with the maximum of 27.20 tons at the same monitoring station. Although the averages are declining, six monitoring locations out of 16 exceeded 10 tons in 1972. Seventy-two plants are closely watched for toxic gas emissions; most of them emit chlorine gases or lead. Monitoring stations for nitrogen oxides increased from five to 12 between 1972 and 1973. Many areas still fail to pass the NOx standard; the monthly averages range between 0.007 and 0.026 ppm. All 10 monitoring locations excluding the 11th reached oxidant maximum hourly levels of 0.15 ppm, and seven monitoring stations reached 0.2 ppm.

50842 **APTIC NO. 70500**

Sapporo District Meteorological Observatory (Japan), Tomakomai Weather Station

THE STATE OF AIR POLLUTION IN TOMAKOMAI. *(Tomakomai ni okeru taiki osen no genjo). Text in Japanese. Sapporo Kanki Kishodai Gijutsu Jiho (Sapporo Dist. Meteorol. Observ. Tech. Bull.), no. 82:27-40, March 1974.*

The paper and lumber industries in Tomakomai city developed rapidly as a new industrial area after the completion of new harbor in 1963. The air pollution measurements initiated in 1963 are now monitored at the Pollution Control Center established in 1973. The data obtained at 26 measuring points in the city were compiled and analyzed. The yearly average settling particulate was 11.2 tons/k sq m/mo in 1972, and the data compiled since 1963 showed a decreasing trend. Within a 1.5 km radius of Ohji Paper Mill, the sulfur dioxide concentration was as high as 0.5 mg/100 cu cm/day. The relationships between the SO2 concentration and meteorological factors were analyzed. The average fluorine gas concentration was 81.2 micrograms/100 cu cm/mo, however, the concentration reached as high as 150-270 micrograms/100 cu cm/mo in the vicinity of an aluminum refinery and fertilizer plant.

50843 **APTIC NO. 70562**

Miyagi Prefectural Government (Japan) Ministry of International Trade and Industry

A REPORT ON THE PRELIMINARY INVESTIGATION FOR THE SENDAI BAY AREA FUTURE INDUSTRIAL POLLUTION. *(Sendai-wan chiku sangyo kogai sogo jizen chosa hokokusho). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(6):60-67, June 1974. 9 refs.*

Since 1969, air pollution control guidelines have been issued to six major industries located in Sendai Bay area. Based on the anticipated pollutant concentrations calculated by the wind tunnel test and theoretical dispersion equation, the necessary recommendations on pollution control by the modification of the smoke treatment method or fuel conversion were made in order to prevent the pollution beforehand. With the cooperation of industries, it is now clear that the environmental standard can be maintained as far as sulfur oxides are concerned. The average amount of settling particulates in Sendai city was 6.67 ton/k sq m/mo in 1971, which was higher than the 4.41 tons/k sq m/mo of 1970. However, the overall pollution due to settling particulate is quite low. The SOx concentration measured by the lead dioxide method was 0.18 mg/100 sq cm/day in 1971, which was slightly lower than 0.25 mg/100 sq cm/day of 1970. The SOx concentration measured by the conductimetric method at 14 measuring points was in the range of 0.025-0.011 ppm (yearly average value), and was below the environmental standards in all cases. The meteorological factors and calculation procedures of dispersion by wind direction and theoretical dispersion equations are described.

50844 **APTIC NO. 70568**

Kumamoto Prefecture (Japan)

POLLUTION WHITE PAPER - 1973. *(Kogai hakusho). Text in Japanese. 263p., March 1974.*

Air pollutant concentrations including sulfur oxides and airborne particulates in the major cities Kumamoto, Arao, Yayo, and Minamata have decreased in the past few years. The average SOx concentrations in 1972 for 8760 hours ranged from 0.014 ppm at the Minamata health center to 0.026 ppm at the Kumamoto City Hall. The average airborne particulate concentrations ranged from 0.081 mg/cu m at the Yayo health center and the Minamata second junior high school to 0.025 mg/cu m at the Arao health center. At the Yayo health center, 77 days out of 354 total measurement days in 1972 gave daily average particulate concentrations higher than the environmental standard of 0.1 mg/cu m. At the Minamata second junior high school, 51 days out of 257 days in the same year gave the same. Measurement results also revealed that automobile exhaust did not impose serious problems in eight major cities subjected to investigation. There were few photochemical injuries compared to other large cities. However, pollution prevention laws were revised in Sept. 1972, and the air pollution regulations were centered on particulate and soot production.

1973

50845 **APTIC NO. 70199**

Lundgren, Dale A.

MASS DISTRIBUTION OF LARGE ATMOSPHERIC PARTICLES. *Minnesota Univ., Dept. of Environmental Sciences, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1973, 163p. 56 refs.*

Mass distribution curves of atmospheric particles ranging from 0.4 (smallest classification size) to 56 micron (largest classification size) were obtained from samples collected in a suburban area free of major industrial activity and significant aerosol sources. All distribution measurements were averages, based on approximately 24-hour samples, obtained on rain-free summer days with 24-hour wind velocity averages of 3-10 mph. A standard high-volume air sampler and a special dustfall plate were operated simultaneously with a special sampling system to determine the total particulate mass distribution. A bimodal mass distribution was obtained with different slopes for particles above 5 micron diameter and those below 3 micron diameter. Recognition of this generally unknown and unaccepted bimodal mass distribution is important for the establishment of more meaningful air quality standards. Standards must be based on a selective measure of the small particles (perhaps less than 4 micron) rather than on a simple nonselective concentration measure (the high-volume air sampler).

50846 **APTIC NO. 64986**

Mishima, Yoshiyuki

INVESTIGATION OF AIR POLLUTION BY AUTOMOTIVE EXHAUST GASES. *(Jidosha haishutsu gasu ni yoru taiki osen chosa). Text in Japanese. In: Data on Studies of Air Pollution in Iwakuni (and Waki Village) Yamaguchi Prefectural Research Inst. for Health (Japan) p. 164-190, Dec. 1973. 29 refs.*

The state of air pollution from automotive exhaust gases in Iwakuni was investigated for 11 days between Dec. 26, 1972 and Jan. 5, 1973. Carbon monoxide was measured by a non-dispersive infrared automatic meter, and nitric oxide and nitrogen dioxide by a Saltzman automatic meter, every hour. In addition, sulfur dioxide and suspended particulates were measured by automatic meters. The wind direction, wind velocity, atmospheric temperature, and humidity were measured every hour. The traffic was measured every hour on National Highway No. 2. The CO measurements on Dec. 26 and 27 were relatively high, with a 24-hr. average of 2.6 ppm, with a maximum level of 5.5 ppm at noon. The amount of traffic was high on Dec. 27 and 28 and on Jan. 1. During the period of investigation, the levels of CO and suspended particulates were within the enviromental standard, but the level of nitrogen oxides and sulfur oxides relatively high. For instance, the Dec. 27 average of NO was 0.185 ppm, and NO_2, 0.099 ppm, and the maximum level for NO was 0.481 ppm and for NO_2, was 0.165 ppm both at noon. These high figures were evidently partly caused by industrial sources. The SO_2 on the 27th was close to the alert level at 0.084 ppm, with a maximum of 0.235 ppm at noon. This was obviously caused by factory emission gases and the sudden shift of wind.

50847 **APTIC NO. 70538**

Nagumo, K.

THE SECRECY OF TOKYO TYPE PHOTOCHEMICAL SMOG PART V. THE THEORETICAL BASIS OF THE CAUSE ATTRIBUTED TO CYANOGEN COMPOUNDS. *(Tokyo-gata kokagaku sumoggu no himitsu (5) shian geninsetsu to sono konkyo). Text in Japanese. Kenko Kaigi (Health Assem.), 25(2):30-34, Feb. 1973.*

The general state of injuries due to photochemical smog and those in Tokyo are reviewed to compare the injuries of Tokyo smog with those of Los Angeles smog and to study the governmental and metropolitan trends in explaining the injuries by the oxidant theory and/or the psychogenic theory. Cyanogen compound sources include acrylonitrile producing factories, coke ovens, metal- plating factories, incomplete combustion of nitrogen-containing organic compounds, and auto exhaust. Greasy particles were collected in 1971 and 1972 in Kawasaki which showed strong erosion to metallic copper and injured human mucosa. The greasy particles may have consisted of tarry materials and cyanogen compounds.

50848 **APTIC NO. 70569**

Funabashi City Pollution Countermeasure Dept. (Japan)

INVESTIGATION REPORT ON POLLUTION AT FUNABASHI CITY. *(Funabashi-shi kogai chosa hokokusho). Text in Japanese. 192p., April 1973.*

The average sulfur oxides concentration measured by the lead dioxide method at 12 locations increased from 0.60 mg sulfur trioxide/100 cu m/day in 1968 to 0.64 mg SO_3/100 cu m/day in 1970, and again decreased to 0.57 mg SO_3/100 cu m/day in 1972. The highest concentration in 1972 was 0.97 mg SO_3/100 cu m/day at the Umikami junior high school. The 1-hour sulfur dioxide concentrations generally were far below the environmental standard of 0.05 ppm. Airborne particulate concentrations measured at five locations from April 1972 to March 1973 showed the highest concentrations of 0.08 mg/cu m at Funabashi city hall and the lowest of 0.02 mg/cu m at the Takane elementary school. Nine warnings on photochemical smog were issued in 1972, and the highest oxidant concentration was 0.197 ppm. A total of 93 injuries were reported, including 54 elementary and junior high school students. Measurements of carbon monoxide concentration at three major intersections on Nov. 11, 1972 showed that at the Hongo intersection, the average concentration for 24 consecutive hr was 10.6 ppm, slightly higher than the environmental standard of 10 ppm.

50849 **APTIC NO. 70624**

Osaka City Government (Japan)

AIR POLLUTION PREVENTION FUNDAMENTAL PLAN - CLEAN AIR PLAN 73. *(Taiki osen boshi kiho keikaku - kurin ea puran 73). Text in Japanese. 81p., Nov. 1973.*

Total consumptions of heavy oil, coal, and coke in Osaka city in 1972 were 2.84 million kl, 53,000 tons, and 743,000 tons, respectively. The largest fuel user was the steel industry followed by ceramic industry chemical industry, and synthetic fiber industry. The total registered automobiles in the city in 1972 was 1.6 million, it almost doubled in the past 7 years. Measurements of the SO_2 concentration at 12 locations showed that up to 48% of the total days failed to meet the new environmental standard of a daily average below 0.04 ppm. At eight monitoring stations throughout the city, from 87.6% to 98.7% of the total days failed to meet the 24-hour value of 0.029 ppm. The 1971 clean air plan was composed of countermeasures for three districts, central, eastern and western Osaka, and automotive exhaust countermeasures. Plants were advised to use desulfurization apparatus and to use fuel containing low sulfur. On-spot checks on automobiles for exhaust conditions were enforced.

50850 **APTIC NO. 73147**

New York State Dept. of Environmental Conservation, Div. of Air Resources

NEW YORK STATE AIR QUALITY REPORT. CONTINUOUS AIR MONITORING SYSTEM (ANNUAL REPORT). *Rept. BAQS-54, 159p., 1973. 3 refs.*

A summary and analysis of ambient air quality data obtained from the New York State Continuous Air Monitoring System during the 4-year period January 1, 1970 to December 31, 1973 is presented. The data are presented in both tabular and graphical form showing hourly, daily, monthly, and annual averages for sulfur dioxide, carbon monoxide, soiling, nitric oxide, nitrogen dioxide, total oxidants, ozone, and total hydrocarbons. High air pollution episodes are also summarized for the year 1973, with a compilation of the number of air quality violations being provided. Appendices to the report provide information on technical details, air monitoring parameters, the location of air monitoring stations, and the structure of air quality regions.

1972

50851 **APTIC NO. 70646**

Osaka Prefectural Government (Japan)

OSAKA AREA POLLUTION PREVENTION PLAN. *(Osaka chiyiki kogai boshi keikaku). Text in Japanese. 296p., Dec. 1972.*

Measurements of sulfur dioxide concentrations in 1971 at 24 locations by the conductivity method showed that 13 locations, mostly in eastern, northern, and central Osaka, failed to meet the environmental standard of 0.05 ppm. The average sulfur oxide concentration in Osaka city area measured at 85 locations by the lead dioxide method was 1.00 mg sulfur trioxide/100 cu m/day. The insoluble dust concentration measurements at 274 locations in 1970 showed that west Osaka city had the highest concentration of 11.68 tons/sq km/mo and that south Osaka had the lowest concentration of 5.27 tons/sq km/mo. The airborne particulate concentration measured by a high volume sampler also showed the highest in west Osaka city area. Measurements of the CO concentration in 1970 at three monitoring stations in the city showed that at Umeda Shinmichi in Kita, a total of 25 days had concentration higher than the environmental standard, an increase of 5 days from the previous year. A total of four warnings on photochemical smog were issued in 1970, but the number increased to eight in 1971 before August 4. The sulfur content in fuel used in 1970 was 1.60%, but is expected to be reduced to 0.56% in 1976 and to 0.22% in 1981. As a result, the SO_2 concentration is expected to be reduced significantly. Countermeasures for particulates and automotive exhaust are also being taken.

ATMOSPHERIC INTERACTION

1975

50852 **APTIC NO. 72983**

Eschenroeder, Alan

FORECASTING REGIONAL PHOTOCHEMICAL AIR POLLUTION. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 42p., 1975. 49 refs. (Presented at the Specialty Conference Long Term Maintenance of Clean Air Standards, Chicago, Ill., Feb. 3-4, 1975.)*

Various types of photochemical air quality models are reviewed in terms of their application to predicting levels of hydrocarbons, oxidants, nitrogen oxides, ozone, and carbon monoxide under various meteorological and source strength conditions. Models considered include empirical, box, Gaussian, and species mass conservation types. Deterministic photochemical diffusion modeling appears to be practical for a wide range of problems, at least in terms of reasonable resources and accuracy. Nevertheless, there are still many approximate applications where nonlinear rollback combined with linear rollback of precursor pollutants is satisfactory for estimating the effects of future emission reductions. For cases where the hydrocarbon to NOx ratios differ significantly from those of today, the deterministic model which contains a chemical mechanism reflecting these influences must be considered for impact evaluations. The application of photochemical diffusion modeling is illustrated in relation to cold morning vehicle starts, vehicle mile reductions, freeway impacts, refinery impacts, electric vehicle substitution impacts, and the impact of various population growth rates.

50853 **APTIC NO. 73104**

Harris, W. F., A. W. Andren, and G. S. Henderson

ENVIRONMENTAL ASSESSMENT OF SO2 AND TRACE ELEMENT EMISSIONS FROM COAL UTILIZATION. *Preprint, Oak Ridge National Lab., Oak Ridge, Tenn., Environmental Sciences Div., 17p., 1975. 14 refs.*

The movement of sulfur dioxide and trace element emissions resulting from coal-burning steam plant emissions in the Oak Ridge, Tennessee area was studied in terms of deposition as dry fallout and rain scavenged washout. Measurements on the Walker Branch Watershed revealed a total sulfate input of 28 kg/hectare/ yr which was offset by streamflow loss of 33 kg/hectare/yr, indicating that sulfur moves rapidly through the landscape. Input-output budgets for zinc, chromium, cadmium, nickel, copper, and lead on the Walker Branch Watershed revealed that inputs exceeded outputs by significant amounts. Zinc exhibited the the greatest loss (an average 27% of the monthly input flux), while Pb exhibited the smallest loss (1.7% of the average monthly input flux). An examination of the biogeochemical cycles for Pb, Zn, and Cd indicated that these elements accumulate in organic soil horizons and small roots. Additional research is needed to asses the long-term effects of sulfate ion on leaching of nutrient and trace elements from terrestrial ecosystems and to establish distribution patterns for other trace elements.

50854 **APTIC NO. 72995**

Landsberg, H. E.

THE DEFINITION AND DETERMINATION OF CLIMATIC CHANGES, FLUCTUATIONS AND OUTLOOKS. *Preprint, Maryland Univ., College Park, 19p., 1975. 36 refs. (Presented at the Atmospheric Quality and Climatic Change Symposium, Chapel Hill, N. C., March 21, 1975.)*

The nature and nomenclature of various types of climatic change are discussed, with particular reference to anthropogenic climatic alterations. Urbanization with its associated heat island effect is responsible for alterations in temperature, humidity, and rainfall on a local scale, while industrialization produces regional changes in climate. An increase in carbon dioxide production on a global scale as well as an attendant increase in temperature result from the burning of fossil fuels as well as from urbanization and industrialization. Global effects involving ozone reduction and increased ultraviolet radiation result from aircraft flying in the stratosphere and from the release of man-made chemical compounds containing chlorine and fluorine. The possibility exists that certain elements of air pollution, if continued beyond a presently as yet unknown critical limit, might induce inrreversible processes such as polar ice melting or ice extension.

50855 **APTIC NO. 73173**

Liou, Kuo Nan and Takashi Sasamori

ON THE TRANSFER OF SOLAR RADIATION IN AEROSOL ATMOSPHERES. *Preprint, Utah Univ., Salt Lake City, Dept. of Meteorology and National Center for Atmospheric Research, Boulder, Colo., 37p., 1975 (?). 27 refs.*

A radiation scheme by which the absorption of water vapor in the near infrared regions of the solar spectrum is inserted into a transfer program for inhomogeneous aerosol atmospheres is theoretically developed. The incorporation of water vapor absorption in a scattering atmosphere is accomplished by a series of exponential fit to band absorptivities based on laboratory measurements. Band-by-band calculations are performed for the heating rate, local albedo, total absorption, and diffuse transmission for hazy and clear model atmospheres. The solar heating rates in a hazy atmosphere may be as much as 5 and 9 C/day for surface albedos of 0.1 and 0.8, respectively. Local-albedo calculations for the entire solar spectrum reveal that a surface albedo of about 0.3-0.4 plays a significant role on the increase or reduction of a globally averaged albedo caused by the increase of aerosol concentrations in the atmospheric boundary layer. An increase of aerosol loading leads to an increase of the total absorption within the atmosphere, while it reduces the solar flux available to the earth's surface for absorption. Consequently, in hazy atmospheres cooling occurs near the surface with warming aloft. The net heating effect for the earth- atmospheric system, however, depends strongly on the surface characteristics. (Author abstract modified)

50856 **APTIC NO. 73047**

Nunge, Richard J. and R. Shankar Subramanian

ATMOSPHERIC DISPERSION OF GASEOUS POLLUTANTS FROM A CONTINUOUS SOURCE - A MODEL OF AN INDUSTRIAL CITY. *Preprint, American Inst. of Chemical Engineers, New York, 53p., 1975. 14 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 79th, Houston, Tex., March 19, 1975, Paper 47f.)*

The dispersion of an inert pollutant emitted by a continuous source into the atmosphere in the presence of an inversion lid is modeled using the eddy diffusivity approach, and model equations are solved with the aid of generalized dispersion theory and a superposition principle. The methodology is illustrated by modeling a multi-source urban-industrial area as a uniform area source discharging the pollutant(s) at an average stack height. A linear wind profile is assumed for convenience. The present method, in contrast to the Gaussian plume model, accounts for wind shear and the existence of an inversion lid in a natural way; it also predicts transient behavior directly. Under certain conditions, steady state conditions over the region, as predicted by the model, are achieved only after several days: meteorological parameters usually change quite significantly over such periods making steady state modeling unrealistic. The model also allows for the determination of the distance downwind of the source at which the concentration in the mixed layer becomes uniform. Although the model is illustrated for a simplified two dimensional system, it can be extended to handle three-dimensional systems with more realistic time-variable winds and source strengths as well as variable eddy diffusivities. (Author conclusions modified)

50857 **APTIC NO. 73103**

Stukel, J. J., R. L. Solomon, and J. L. Hudson

A MODEL FOR THE DISPERSION OF PARTICULATE OR GASOUS POLLUTANTS FROM A NETWORK OF STREETS AND HIGHWAYS. *Preprint, Illinois Univ., Urbana, Dept. of Chemical Engineering, 35p., 1975. 30 refs.*

A computerized model for predicting the atmospheric transport of particulate and gaseous pollutants from finite length line sources representing a network of city streets and rural highways is described. The model can be used to predict the dispersion of pollutants in any region of flat terrain. The inputs required are the coordinates of the highway segments, traffic counts, and meteorological conditions. The model includes transport by advection, turbulent dispersion, and settling. A computer program is written to predict the distribution of pollutants from any combination of line segments which represent streets or highways. The model is applied to predicting the distribution of lead emitted from automobiles in the vicinity of Urbana-Champaign. (Author abstract modified)

50858 **APTIC NO. 73000**

Sullivan, J. L., D. Lew, and D. Yeung

SOURCE IDENTIFICATION BY AMBIENT AIR QUALITY MEASUREMENTS. *Preprint, American Inst. of Chemical Engineers, New York, 13p., 1975. 3 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 79th, and the 8th Petrochemical and Refining Exposition, Houston, Tex., March 16-20, 1975, Paper 62b.)*

Attempts to correlate particle emissions from specific large industrial sources with measured ambient concentrations are described, with particular reference to the Detroit-Windsor area. A method for plotting total suspended particulate concentrations above a fixed value against percentage wind direction was applied to the area in order to overcome difficulties associated with the variability of wind direction. A good degree of correlation was achieved in some cases where a test station was appropriately related to one or a small number of major sources. The identification of specific sources in an area as complex as Detroit-Windsor proved to be impractical; nevertheless, the technique might be more readily applicable to simpler situations.

50859 **APTIC NO. 73132**

Oak Ridge National Lab., Tenn., Environmental Sciences Div.

ATMOSPHERIC DISTRIBUTION OF SULFUR DIOXIDE. *In: Environmental Sciences Division Annual Progress Report. Rept. 653, UC-48, p. 104-105, March 1975.*

NTIS: ORNL-5016

A multisource dispersion model for predicting the atmospheric distribution of sulfur dioxide was applied to the Harriman Quadrangle in eastern Tennessee (35 deg 30 min and 36 deg north latitude and 84-85 deg west longitude). The area is impacted by three large fossil-fueled steam plants that release more than 110,000 tons of SO2 annually. Ground level concentrations were provided at the midpoints of each of 32 7.5 by 7.5 min quadrangles that constitute the Harriman Quad to assess the effect of present emissions in the area and the effect of a hypothetical fossil fuel plant. Large SO2 concentrations, according to the model, do not extend farther than one 7.5 ft quad from the quad in which the point source is located. The emissions of the hypothetical plant do not significantly increase the concentrations of SO2 in the 7.5 min quadrangles affected by the existing fossil fuel plants. The calculations provide relevant information for assessing and planning operations concerned with chronic exposure levels.

1974

50860 **APTIC NO. 69002**

Aida, Katsuru, Miyoko Kawakami, and Shinichi Nagai

THE STERIC STRUCTURE OF AIR POLLUTION IN THE METROPOLITAN AREA. *(Shutoken no taiki osen no rittai kozo). Text in Japanese. Kisho Kenkyu Noto (Meteorol. Study Note), no. 119:367-373, 1974. 4 refs.*

The result obtained from the preliminary observation of the distribution of aerosol inducing degradation by sunshine is discussed. Aerosol distribution in the atmosphere in terms of altitude shows that the relative concentration of aerosol compared with that of molecules constituting the air decreases rapidly and increases slightly in the stratosphere, which is due to the fact that after being sent up in the atmosphere by volcanic activities aerosols remain in the stratosphere for a long time. The strength of sunshine on the ground and the sunshine disappearance coefficient are presented in the form of an equation. In order to conduct a survey of air pollution situations, observations were made on the campus of Yokohama University and along a highway network stretching in all directions. In the case of the former there exists a considerable difference in sunshine disappearance coefficient depending on days. The sunshine disappearance coefficient on a clear day as well as that of another day when the sky became impurely white with poor visibility are reported. A regional change in sunshine disappearance coefficient was measured from a mobile unit along the Tomei expressway.

50861 **APTIC NO. 73022**

Altshuller, A. P.

ON-GOING RESEARCH IN EPA S CHEMISTRY AND PHYSICS LABORATORY ON POLLUTANT TRANSPORT AND TRANSFORMATION. *Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., (Solvent React. Conf. Proc., Research Triangle Park, N. C., 1974), EPA-650/3-74-010, p. 2-5, (Nov.)*

Oxidant (ozone and peroxyacyl nitrates) formation and transport are discussed in terms of their impact on the oxidant-reactivity of solvents and organic substances emitted from petrochemical manufacturing and distribution. Oxidant formation is particularly sensitive to the ratio of organics (hydrocarbons) to nitrogen oxides present as reactants in the air. Oxidants do not start forming at measurable concentrations until essentially all of the NO present is converted to nitrogen dioxide. Reducing the hydrocarbon/NOx ratio slows down the rate of conversion of nitric oxide/NO2 and the rate of oxidant formation. Changes in the reactant ratio or organic composition which can reduce oxidant concentration levels near the origin of high emission loadings may not, however, reduce oxidants further downwind; thus, control measures that are effective in the urban area where they are initiated may not be effective 50 or 100 mi downwind. The determination of which paraffinic hydrocarbons are essentially non-reactive or of low reactivity under a wide range of conditions is particularly important since paraffinic hydrocarbons constitute an important group of substances with respect to control of organic emissions from solvent use, petroleum production and refining, and petroleum distribution (including vapor losses).

50862 **APTIC NO. 70540**

Amaya, Kazuo

ON THE CAUSE OF SO CALLED NIGHT SMOG. *(Nito sumogu no genin nitsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):167, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 20.)*

The high level of oxidants detected at night are clearly not photochemical reaction products, and because of this, a so-called night smog is suspected. The data, collected during 3 mo in 1972 by the Tokyo Metropolitan Research Inst. for Environmental Protection, indicated that nitric oxide was responsible for night smog. The NO is oxidized to nitrogen dioxide, determined by an oxidant detector. A highly concentrated heavy gas, likely to be chlorine, and carbon monoxide were also present with night smog. Since a high CO level did not match the traffic pattern, automobile exhaust was excluded as the primary source for night smog. A plant discharging high levels of all three pollutants, NO, CO, and chlorine gases, could be one burning hydrogen cyanide which can produce as high as 10,000 ppm nitrogen oxides. Such a plant uses sodium hypochlorite to remove HCN from its process, and the burning of HCN emits chlorine gas as well as CO. This is not conclusive, but the burning of HCN is likely to be responsible for night smog.

50863 **APTIC NO. 73059**

Bogh, Pery

EXPERIENCE WITH COMBINED WIND TUNNEL-PLUME MODEL ANALYSIS OF COOLING-TOWER ENVIRONMENTAL IMPACT. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 265-290, 1975. 6 refs. (March 4-6.)*

A procedure for the evaluation of cooling tower environmental impact using combined wind tunnel-plume model analysis is described and illustrated for two 1300 MW units of a nuclear power plant. Complete aerological soundings of two or three representative years are fed into a classification program, with approximately 10% of the soundings being chosen as representative for their class. The data are then passed on to a plume model; wind tunnel experiments are simultaneously run, and corrections on plume behavior are determined with feedbacks between the wind tunnel data and the plume model calculations. The output of the plume model is evaluated on a tower evaluation program which is also fed synoptic data. Typical data are presented for humidity increase, natural and artificial precipitation, salt deposition, and plume behavior.

50864 **APTIC NO. 73461**

Brown, Robert M. and Paul Michael

MEASURED EFFECT OF SHEAR ON PLUME DISPERSION. *Preprint, American Meteorological Society, Boston, Mass., 6p., 1974. 5 refs. (Presented at the Atmospheric Diffusion and Air Pollution Symposium, Santa Barbara, Calif., Sept. 9-13, 1974.)*

NTIS: BNL 18951

Aircraft traverses and theodolite pilot balloons were used to measure the effect of wind shear on plume dispersion from three 183-meter stacks located 60 m apart. Crosswind standard deviations were greater during stable conditions than during neutral conditions due to the larger wind shears associated with increased stability. Wind shear appears to be the dominant factor in plume dispersion at great distances (over 10 km) downwind during stable conditions. (Author conclusions modified)

50865 **APTIC NO. 73057**

Carson, James E.

METEOROLOGICAL CONSEQUENCES OF THERMAL DISCHARGES FROM NUCLEAR POWER PLANTS - RESEARCH NEEDS. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 221-228, 1975. 4 refs. (March 4-6.)*

Research needs related to estimating the meteorological consequences of thermal discharges from nuclear power plants are outlined. Theprimary need is a series of field studies at operational plants to determine the exact effects of cooling towers on the environment and to provide data for mathematical models. Areas in which additional field measurements and research are most urgently required include: plume rise and length of the visibile plume from all types of cooling towers, fogging and icing from cooling ponds and mechanical-draft cooling towers, drift and the effects of salt deposition, and the interaction of cooling tower plumes with other pollutants, especially sulfur dioxide. (Author abstract modified)

50866 **APTIC NO. 70552**

Chester, R. and J. H. Stoner

THE DISTRIBUTION OF MN, FE, CU, NI, CO, GA, V, BA, SR, SN, ZN, AND PB, IN SOME SOIL-SIZED PARTICULATES FROM THE LOWER TROPOSPHERE OVER THE WORLD OCEAN. *Marine Chem., 2(3):157-188, Nov. 1974. 28 refs.*

Trace element analyses were performed on soil-sized particulates collected on board ship by a mesh technique from the lower troposphere of the North, Equatorial, and South Atlantic Ocean, northern and southern Indian Ocean, South and East China Sea, and various coastal localities. The average concentrations of lead (588 ppm), zinc (780 ppm), and tin (30 ppm) were enriched by one order of magnitude over those in average crustal material (12.5, 70, and 2 ppm, respectively). The geographical variations in these metals were related to anthropogenic sources, with concentrations being highest in coastal atmospheric particulates adjacent to industrialized sources. The enrichment factors of barium, copper, nickel, and vanadium were higher in particulates from the Westerlie (2.1-5.1) than in those from other wind systems and generally decreased towards lower latitudes in both hemispheres. On the basis of trace element distributions, lower tropospheric marine particulates were divided into four genetic components: local, zonal, interzonal, and global; each may have both an anthropogenic and a natural fraction. The transportation of soil-sized particulates via the atmosphere appears to introduce such elements as Sn, Pb, and Zn directly to open-ocean areas in concentrations which exceed the natural input.

50867 **APTIC NO. 72979**

Colbaugh, William C., John P. Blackwell, and Jack M. Leavitt

INVESTIGATION OF COOLING TOWER PLUME BEHAVIOR. *Chem. Eng. Progr. Tech. Man., no. 140:83-86, 1974 (?).*

Ground-level photographic techniques and aerial surveys were used to define the vapor plume configuration and behavior of three hyperbolic, natural-draft, wet-counterflow cooling towers serving a coal-fired power plant. Average plume lengths varied from 0.3-5.4 km. Although no adverse environmental effects were observed, measurable increases in temperature and moisture content of the atmosphere downwind of the visible plume were observed along with the detection of mist both under the visible plume and downwind. A maximum increase in relative humidity of 16.6% was recorded at 400 m downwind and an elevation of 365 elevation, at 1200 m downwind and an elevation of 425 m (maximum) the maximum increase in relative humidity was 12.3%. Mist was detected up to an elevation of 180 m in the former case and 60 m in the latter case.

50868 **APTIC NO. 71198**

Cowser, K. E., M. Reeves, III, P. G. Fowler, and W. M. Culkowski

EVALUATION OF THE POTENTIAL RADIOLOGICAL IMPACT OF GASEOUS EFFLUENTS ON LOCAL ENVIRONMENTS. *Preprint, Oak Ridge National Lab., Tenn., Health Physics Div., p. 923-940, 1974 (?). 19 refs.*

The computerized application of an atmospheric transport model to the estimation of potential radiological impact from gaseous effluents emitted from nuclear facilities is described. A computer code is used for the calculation of average annual downwind air concentrations and ground surface deposition rates for routine stack releases, with the results being displayed as contour plots. The release of radioactive noble gas from a boiling water reactor is used to illustrate the program application and shows that radioactive production and decay result in a significant depletion of radionuclides from the pollution cloud and a corresponding reduction in submersion dose rate for this particular example. Precursors of potential interest, however, are produced as the decaying chain of radionuclides continues its atmospheric sojourn. Dry deposition and washout are of lesser importance in this example. Care must be taken to include all potentially critical modes and pathways of exposure in a total dose assessment as well as in the proper interpretation of potential exposure.

50869 **APTIC NO. 70649**

Delany, A. C., J. P. Shedlovsky, and W. H. Pollock

STRATOSPHERIC AEROSOL: THE CONTRIBUTION FROM THE TROPOSPHERE. *J. Geophys. Res., 79(36):5646-5650, Dec. 20, 1974. 18 refs.*

Aerosol samples collected during stratospheric flights over the midcontinental United States were analyzed by neutron activation for sodium, chlorine, potassium, manganese, bromine, and silicon compounds. The flights were made in autumn and in spring along the 39 deg north parallel between 109 and 87 deg west at altitudes of 11.0, 13.4, 15.8, 18.2, and 20 km. The long sampling paths served to integrate variations in aerosol mixing ratio and composition, thus providing a good representation of mean aerosol composition. Plotting of the mass mixing ratios of the elements against altitude revealed the presence of earth surface-generated aerosol particulates in the stratosphere. The element ratios of Na/Si and Na/K were consistent with this tropospheric aerosol component, having the same composition as the upper tropospheric background aerosol. Determination of the relative contribution of continental and oceanic components by considering the ratio of the nonvolatizable elements, Si, Na, and K, showed that sea salt accounts for no more than a few percent of the tropospheric contribution. Stratospheric chlorine and bromine concentrations were in excess by two- and 200-fold, respectively, over values consistent with the marine component of the tropospheric contribution. Thus, chlorine and bromine were capable of entering the stratosphere in a gaseous form and reacting to give aerosol particulates.

50870 **APTIC NO. 70101**

Desalu, Adewunmi, Leonard A. Gould, and Fred C. Schweppe

DYNAMIC ESTIMATION OF AIR POLLUTION. *IEEE Inst. Elec. Electron. Engrs. Trans. Autom. Control, 19(6):904-910, Dec. 1974. 25 refs.*

An advection-diffusion model of air pollution over an urban area is developed. The region is subdivided into a grid, and the three-dimensional partial differential equation of the pollution concentration is reduced to a linear vector difference equation. Along with this discrete equation, a stochastic model of air pollution is considered, and pollution concentrations over the area are estimated from observed data generated by a few monitor points. High dimensionality of the resulting Kalman filter equation is avoided by using a discrete form of Chandrasekar-type equations. Diffusion coefficients in the advection-diffusion model, which are difficult to specify accurately, are also identified. (Author abstract)

50871 **APTIC NO. 70710**

Drivas, Peter J. and Fredrick H. Shair

A TRACER STUDY OF POLLUTANT TRANSPORT AND DISPERSION IN THE LOS ANGELES AREA. *Atmos. Environ., 8(11):1155-1163, Nov. 1974. 37 refs.*

Pollutant transport and dispersion studies in the Los Angeles area were performed using sulfur hexafluoride as a tracer. A release of 33.5 kg of SF6 over a 45 minute period was traced from the city of Anaheim to five neighboring communities. All air samples were taken about 1 m above ground and in open spaces; ambient air samples taken two days prior to release indicated no detectable SF6 concentrations in each of the locations. A preliminary analysis of the data indicated that the cities of Riverside and Palm Springs may possibly lie in a direct path of the pollutant transport from Anaheim. Palm Springs, which at 124 km from Anaheim was the furthest location tested received eight times the amount of tracer recorded in Cajon Pass and half the amount recorded in Pomona, which was only 34 km distant from the release point. Since the tracer is nontoxic and the test relatively inexpensive, SF6 appears to be an ideal tracer for studying the transport and dispersion of pollutants over urban areas. (Author abstract modified)

50872 **APTIC NO. 70777**

Drivas, Peter J. and Fredrich. H. Shair

PROBING THE AIR FLOW WITHIN THE WAKE DOWNWIND OF A BUILDING BY MEANS OF A TRACER TECHNIQUE. *Atmos. Environ., 8(11):1165-1175, Nov. 1974. 25 refs.*

Sulfur hexafluoride tracer, detected by electron-capture gas chromatography, was used to probe the characteristics of air flow and pollutant dispersion around a 12-meter high, three-story building. A reverse-flow circulation was observed, with a longitudinal extent downwind of about three building heights. The extent of the recirculation on the roof was confined to less than one-half the width of the building from the downwind edge. The recirculating velocities in the wake were estimated to be about 0.1-0.3 of those of the prevailing wind at the top of the building. The wake downwind of the building was well-mixed in all three dimensions and exhibited a characteristic exponential dilution time of approximately 1 min. Regarding the potential for indoor pollution, about 10 cu cm of SF6 were released inside the building s main ventilation intake, and concentrations of the tracer were monitored on each floor within the building as well as on the roof near the main intake vents. (Author abstract modified)

50873 **APTIC NO. 70712**

Eagleman, Joe R.

A COMPARISON OF URBAN CLIMATIC MODIFICATIONS IN THREE CITIES. *Atmos. Environ., 8(11):1131-1142, Nov. 1974. 10 refs.*

An investigation of diurnal climatic modifications in three urban areas (urban heat island effect) over a 16-month period indicated a systematic increase in temperature, comfort index, and potential evapotranspiration of vegetation, along with a decrease in the relative humidity. The average changes in climatic parameters for these three urban areas (populations of 45,000 to over 1 million) were a 5.2 F temperature increase, a 9.5% relative humidity decrease, a 3.2 comfort index increase, and a potential evapotranspiration increase of 0.09 in./day. These climatic changes were related to the magnitude of urbanized area by a logarithmic relationship, indicating the possibility of predicting modifications resulting from future urban expansion. Cities may initiate their own circulation system as the urban heat island develops; if the mixing layer extends above the stack heights within the city, a fumigation situation results. (Author abstract modified)

50874 **APTIC NO. 70204**

Fahien, Ray W., Suresh B. Pahwa, and Dale W. Kirmse

STATISTICAL MODELING OF ATMOSPHERIC TRANSPORT. *Preprint, American Inst. of Chemical Engineers, New York, 41p., 1974. 29 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 67th, Washington, D. C., Dec. 1-5, 1974.)*

A turbulent diffusion model was developed based on the statistical theory of atmospheric turbulence. The model is capable of explicitly taking into account the effects of different physical and meteorological parameters. Predicted concentration distributions compare favorably with experimental field observations. Stability conditions, surface roughness, source height, and vertical inhomogeneity can be taken ac count by using correlated velocity distributions and turbulent intensity data. The stochastic model can be used for concentration predictions or may be used to estimate the dispersion coefficients used in other diffusion models. The reasonably accurate prediction of pollution levels is a requirement for pollution control and is of importance for modern urban development. (Author conclusions modified)

50875 **APTIC NO. 70322**

Fujitani, F., T. Yokoyama, and F. Matsunari

ROADSIDE DIFFUSION OF NO. *(NO no endo kakusan). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):497, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Nov. 6-8, 1974, Chiba, Japan, Paper 343.)*

The diffusion of nitric oxide at roadside was measured by the batch type Saltzman method at two locations in Nagoya. The peak of horizontal NO concentration distribution was found at the leeward edge of the road in the case of wind direction at a right angle to road, and at a median strip in the case of wind direction at a 22.5 degree angle to raod. The result of the former was in good agreement with the concentration distribution calculated from Fick's diffusion equation, which showed no peak at the median strip. The diffusion coefficient was estimated to be about 2-4 sq m/sec. The NO concentration distribution was also measured at three major roads. The horizontal distribution showed high NO concentration only at the edge of road. The measurement of vertical distribution indicated that NO concentration at 0.5 m altitude was less than that at 1.5 m in all cases, and decreased generally with altitude higher than 2 m.

50876 **APTIC NO. 70318**

Fujitani, Y. and H. Mizuno

ROADSIDE POLLUTION AND ITS AVERAGE CHARACTERISTICS. *(Nagoya chiku ni okeru endo osen to sono heikin-teki keiko). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):491, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Nov. 6-8, 1974, Chiba, Japan, Paper 337.)*

Roadside pollution was surveyed at 26 measuring points spread over the area covering downtown Nagoya to Nanba industrial area. The concentrations of sulfur dioxide, dust, nitric oxide, nitrogen dioxide, oxidant, carbon monoxide, and hydrocarbons were measured continuously along with wind velocity, wind direction, temperature, humidity, insolation intensity, amount of rainfall, and traffic volume. The most frequent wind direction was northwest wind, average wind velocity was 2.2 m/s, and average temperature was 16.0 C. The daily and weekly variations in traffic volume were analyzed in regard to the location. The pollutant concentrations were analyzed in terms of hourly, monthly and seasonal variations taking the meteorological factors into consideration. The general characteristics of each pollutant concentration are discussed. The pollutant concentrations were also evaluated in reference to the environmental standard.

50877 **APTIC NO. 70684**

Fukuhara, Kenji

BASIC INVESTIGATION OF AIR POLLUTION AND WEATHER FORECAST-MAINLY THE RELATIONSHIP WITH WIND, NOVEMBER. *(Taiki osen kisho yoho no kiso chosa--shutoshite kaze tono kankei, 11 gatsu ni tsuite). Text in Japanese. Kishocho Gijutsu Shiryo Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), no. 1:9-16, Feb. 1974.*

Pollution forecasting based on meteorological conditions was investigated using data on sulfur dioxide concentrations obtained at five monitoring stations in Osaka and meteorological data during the month of November in 1966, 1967 and 1968. The data were analyzed with reference to the geostrophic wind direction, variation in wind direction, and variation in wind velocity (standard deviation), which indicated that the southerly wind was associated with high pollutant concentrations. The composite weather map in cases of high and low pollutant concentrations was prepared using the geostrophic wind directions. The difference in pressure gradient was evident, and the local high pressure and low temperature zone were associated with high pollutant concentrations. The effect of temperature variations in the upper atmosphere was investigated. In the case of a temperature elevation at 500 mb with a pressure gradient less than 2.5 mb, the high pollutant concentration occurrence was 76% and the moderate pollutant concentration was 24%. The relationship between the wind direction in the upper atmosphere and the average pollutant concentration indicated that the high pollution occurrence in the morning was 92% in the case of the southwest quadrant. Wind direction forecasting can be a means of forecasting pollutant concentrations. Examples of pollution forecasting diagrams are shown.

50878 **APTIC NO. 70338**

Ghazi, Anver

SATELLITE NIMBUS RECORDS OZONE DECREASE IN THE ATMOSPHERE. *(Satellit Nimbus registriert Ozonabnahme in der Atmosphaere). Text in German. Umschau Wiss. Tech., 74(21):679-680, 1974. 4 refs.*

The global ozone budget is calculated for the first time using satellite data. Nimbus IV measurements show a net loss of atmospheric ozone in the tropics in 1971. In April of 1971 the global ozone mass of 3.38 times ten to the ninth power tons was about 3.5% smaller than in April of 1970. This variation of the ozone mass might be due to meteorological or photochemical processes. The resulting increase in the ultraviolet radiation might have had an impact on the tropical biosphere.

50879 **APTIC NO. 72969**

Gifford, F. A.

A NOTE ON THE ELEVATION OF THE MEAN AND THE MODE OF THE GAUSSIAN CONCENTRATION DISTRIBUTION. *In: Environmental Research Laboratories 1973 Annual Report. National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., Rept. ATDL-106, p. 31-35, Dec. 1974.*

Equations governing the height of the mean and the mode of the Gaussian concentration distribution of a plume emitted from a stack are derived, starting with the Gaussian equation for the concentration relative to a continuous source strength. The expressions derived indicate that near the stack both the mean and the mode are located at stack height. Farther downwind near the point at which the vertical spreading grows to near the stack height, the pattern changes. The height of the mean than increases for both reflection an/absorption as the vertical spreading increases, whereas for reflection mode decreases abruptly to zero. The relationship, if any, of these features to the observed behavior of real plumes is not defined.

50880 **APTIC NO. 71352**

Ishii, Akio

INVESTIGATION OF AIR POLLUTION IN URBAN AREA DURING HEATING SEASON, PART 4. *(Toshi bu gai no taiki osen ni kansuru chosa, sono 4). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):516, Nov. 1974. (Presented at the National Air Pollution Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper [illegible].)*

The contribution of three buildings as air pollution sources to a stationary receptor was calculated based on wind direction by using an atmospheric diffusion equation. The contribution is designated as a source distribution factor (SDF) with a function of wind direction, and displayed in a circular diagram. Wind directions are indicated on the circumference of the circle and the SDF values are indicated by the distance from the center. The diagram enabled analyses of the contribution of pollution sources to the receptor to be made; for example, a small SDF value was observed with a westerly wind, and none of the three buildings were located west of the receptor.

50881 **APTIC NO. 70747**

Israel, G. W.

DEPOSITION VELOCITY OF GASEOUS FLUORIDES ON ALFALFA. *Atmos. Environ., 8(12):1329-1330, Dec. 1974. 6 refs.*

Fumigation of alfalfa and orchard grass with constant hydrogen fluoride levels for more than 16 days yielded a deposition velocity of 16 mm/sec as compared with an estimated deposition velocity for field crops of alfalfa and orchard grass of 31 + or - 16 mm/sec. The estimated average fluoride accumulation coefficient for field crops was about twice that derived from the fumigation studies, though the reason for the discrepancy was not established. The deposition velocity values for alfalfa were about 3-6 times higher than published deposition velocity values for sulfur dioxide on grass. This difference may be partially due to the relatively large leaf surface area of alfalfa per unit area of ground and the vertical spacing of the leaves. Assuming that atmospheric fluorides are admitted by ghe plant mainly through the leaves and that the effective fluoride absorption area is 5 sq m of leaf surface per sq m of ground surface, the alfalfa deposition velocity is similar to SO2 deposition velocities reported for grassland.

50882 **APTIC NO. 73072**

Israel, Gerhard W. and Thomas J. Overcamp

DRIFT DEPOSITION MODEL FOR NATURAL-DRAFT COOLING TOWERS. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 614-628, 1975. 21 refs. (March 4-6.)*

A model for calculating salt deposition from natural-draft cooling towers that use brackish water or sea water is described. The model incorporates a method for estimating the effective height of drift droplet emissions and the combined effects of sedimentation, evaporation, and dispersion of the droplets due to atmospheric turbulence. The deposition equation, expressed in nondimensional form, reveals that turbulence effects must be incorporated to correctly calculate the deposition around the tower except for very stable atmospheres. Sample calculations for a natural-draft tower with a height of 100 m, an exit diameter of 60 m, a total sodium chloride emission of 0.008 kg/sec, and a drift rate of 0.002% indicate that about 50% of the mass emissions are from droplets with diameters less than 100 micron. (Author abstract modified)

50883 **APTIC NO. 73157**

Jones, Douglas M. A., Floyd A. Huff, and Stanley A. Changnon, Jr.

CAUSES FOR PRECIPITATION INCREASES IN THE HILLS OF SOUTHERN ILLINOIS. *Illinois Board of Natural Resources and Conservation, Urbana, State Water Survey Div., RI-75, ISWS-74-RI75, 39p., 1974. 20 refs.*

The causes for precipitation and cloud cover increase over the hills of southern Illinois were investigated by taking average monthly precipitation values, defining the hill area maximum with a dense recording raingage and wind recording network, and performing intensive field studies in the area for 1 yr. The cause of precipitation in the hill area as compared to surrounding flatlands appeared to be a combination of moisture addition due to greater evapotranspiration from the forested hills and the convergent wind field created over the western hills as a result of the configuration of the hills and valleys. The precipitation anomaly was not caused by nuclei generated locally by the forests since there appeared to be no mechanism operative with sufficient frequency to raise the nuclei from the forest floor into the convective systems. (Author abstract modified)

50884 **APTIC NO. 72958**

Jones, Herbert C.

PREOPERATIONAL ATMOSPHERIC MONITORING IN THE CUMBERLAND STEAM PLANT AREA: THE PH AND SULFATE CONTENT OF PRECIPITATION. *Tennessee Valley Authority, Muscle Shoals, Ala., Air Pollution Effects Section, Rept. E-EB-74-1, 27p., Nov. 1974. 27 refs.*

Rainfall samples collected around the Tennessee Valley Authority Cumberland Steam Plant before operation for the period September 1971 through July 1972 were analyzed for pH and sulfate. The rainfall in the area was much more acidic than geologically pure rainfall (ph 4.5 as compared with pH 5.7), though insufficient information exists to predict whether sulfur dioxide emissions from the steam plant are capable of further increasing rain acidity. The weighted average concentration of sulfates (5.4 mg/l) washed out in precipitation during the 11-month period before the steam plant began operating was about three times that considered to be background for areas remote from sources of sulfur emissions. The installation of five additional monitoring stations in the Cumberland Steam Plant air monitoring network to obtain more complete statistics on pH and sulfur content of precipitation is recommended along with the installation of precipitation collectors at regional air quality monitoring stations for observing long-term trends in precipitation acidity.

50885 **APTIC NO. 73058**

Junod, A., R. J. Hopkirk, D. Schneiter, and D. Haschke

METEOROLOGICAL INFLUENCES OF ATMOSPHERIC COOLING SYSTEMS AS PROJECTED IN SWITZERLAND. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 239-264, 1975. 21 refs. (March 4-6.)*

Numerical studies of the meteorological effects of large heat discharges into the atmosphere from evaporative natural-draft cooling towers showed that the main impact is the persistence of the visible condensed water plume. There were also slight local reductions in the solar radiation intensity reaching the ground and, under special conditions, increases in precipitation downwind of cooling towers. Field tests on a 110-meter high natural-draft cooling tower verified the success of the conceptual model studies. Limitations of the conceptual model are its inability to treat individual cases with wind shear and to account for modified turbulence due to neighboring high buildings or very pronounced topographical influences. (Author abstract modified)

50886 **APTIC NO. 70347**

Kamm, Klaus

THE INFLUENCE OF TWO-DIMENSIONAL CIRCULAR RESP. ELLIPTICAL DISTURBANCE OF THE WIND POTENTIAL OVER THE DISTRIBUTION OF POLLUTANT GASES BY STACKS. *(Der Einfluss zweidimensionaler kreisfoermiger bzw. elliptischer Windpotentialstoerungen auf die Verteilung von Schadgasen durch Schornsteine.) Text in German. Meteorol. Rdsch., 27(6):161-166, Dec. 1974. 7 refs.*

A mathematical simulation model is described which permits the study of the influence of uneven topography on transmission processes of waste gases. The simulation model is based on the assumption that the wind field in the transmission area is subject to a topography influenced two-dimensional potential flow. With this procedure it is possible to correct the stack height to take into account the influence of topography on the maximum ground level emission concentration of stack waste gases. An example shows that without application of this procedure, a wrong estimate of the emission risk is obtained.

50887 **APTIC NO. 70504**

Kawamura, Takeshi

METEOROLOGICAL CONSIDERATION ON PHOTOCHEMICAL OXIDANTS OVER ENTIRE AREA OF KANTO DISTRICT. *(Kanto chiho ni okeru koiki no okishidanto osen no kishoteki kosatsu). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 10(10):16-21, Oct. 1974.*

Photochemical smog occurs in Kanto district during April-October, particularly between June-August. A total of 180 warnings (oxidant concentration higher than 0.15 ppm) were issued in the district in 1973. The meteorological conditions for photochemical smog in Tokyo, which is at the center of this district, are as follows: high degree of pressure variation with alternating high and low pressure; between rainy days or after raining; above 24 deg temperature; wind velocity below 4 m/sec; sea wind from the east coast; 60-80% humidity at 9 am; 24-25 deg ocean temperature in the gulf of Tokyo. Further studies on the wind system at an altitude of 1500 m north of the Kanto plain and on the district difference in the height of the inversion layer are necessary.

50888 **APTIC NO. 70573**

Kertesz-Saringer, M., Z. Morlin, and E. Meszaros

SEPARATION OF AIR POLLUTING POLYCYCLIC AROMATIC HYDROCARBONS FROM THE ATMOSPHERE. *(Ausscheidung luftverunreinigender polyzyklischer aromatischer Kohlenwasserstoffe aus der Atmosphaere). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 20(11):766-768, 1974. 6 refs.*

The sedimentation speed of polycyclic aromatic hydrocarbons (PAH) on days with and without precipitation was calculated according to a given formula after the PAH content in dust samples was analyzed. In addition, the sedimented dust quantity and the quantity of airborne dust were measured. The following PAH were determined: anthracene, phenanthrene, 20-methylcholanthrene, fluoranthene, 1,2-benzanthracene, benzo-3,4-pyrene, perylene, 1,2,5,6-dibenzanthracene, 1,2-benzpyrene, 1,12-benzperylene, coronen, 3,4,9,10-dibenzpyrene, 1,2,3,4,-dibenzpyrene, chrysene, and pyrene. The samples were taken over a period of nearly two years from Nov. 1971 to Oct. 1973. Since PAH are mainly adsorbed on respirable dust particles their sedimentation speed is slower than that of total dust and amounts on the average to 6.4% of the sedimentation speed of total dust. According to earlier results 85% of benzo-3,4-pyrene is adsorbed on particles with a radius of less than 2-3 micron. Emitted PAH-compounds remain about 7 to 16 days in the atmosphere. Their residence time in the atmosphere is 16 times larger than that of total dust.

50889 **APTIC NO. 73013**

Kofsky, Irving L., Christian A. Trowbridge, and Ronald H. Johnson

ANALYSES OF CHEMICAL AND SMOKE RELEASES IN THE ATMOSPHERE (FINAL REPORT). *PhotoMetrics, Inc., Lexington, Mass., Air Force Contract F19628-71-C-0018, Proj. 7635, Task 763514, Work Unit 76351401, Rept. AFCRL-TR-74-0102, PhM 104-74, 77p., Jan. 31, 1974. 19 refs.*

NTIS, DDC: AD783909

Methods for the photographic photometric analysis of tracer materials released into the stratosphere and upper atmosphere by aircraft and rockets were developed in conjunction with studies of winds, diffusive and turbulent transport, and atmospheric chemical processes. The major fraction of work performed involved the reduction and analysis as well as the radiometric calibration of photographs of tracer materials. The images of released materials were reduced by microdensitometry, and improved techniques for scanning and Fourier transform analysis of photographically-recorded radiance distributions were developed. Montages were used to display the development of an atmospheric release glow. The effects of different types of data averaging and filtering on computations involving turbulence parameters and diffusion coefficients were also examined. General purpose routines were developed to allow for the control of picture processing hardware by means of Fortran program calls. The agitation required for uniform processing and accurate photographic photometry appeared to depend on the specific film type, with sufficiently uniform processing being achieved by increasing both the amplitude and frequency of the vertical motion of the film- carrying reel.

50890 **APTIC NO. 73071**

Laskowski, Sofia M.

MATHEMATICAL TRANSPORT MODEL FOR SALT DISTRIBUTION FROM A SALTWATER NATURAL-DRAFT COOLING TOWER. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 598-613, 1975. 8 refs. (March 4-6.)*

A mathematical model that predicts the salt deposition rate and air salt concentration versus distance and direction from natural-draft cooling towers as a function of tower characteristics, drop size distribution, mass drift rate from the tower, and meteorological conditions is described. The model follows the behavior of representative drift droplets of selected initial size and salinity as they travel from the top of the drift eliminators through the plume and ambient air until they deposit on the ground. Growth and/or evaporation of the drops is accounted for as a function of the droplet salt concentration, temperature, and atmosphere surrounding the drop. The effects of gravity, air movements, precipitation, and the aerodynamic wake of the tower are also incorporated in the model. Plume behavior is based on the formulas of Briggs and of Slawson and Csanady. Average salt deposition rates are predicted by three computer programs. (Author abstract modified)

50891 **APTIC NO. 73014**

Lazrus, A. L., B. W. Gandrud, and J. P. Lodge, Jr.

ACIDITY OF U. S. PRECIPITATION. *Preprint, National Center for Atmospheric Research, Boulder, Colo., 16p., 1974 (?).*

Patterns of hydrogen ion concentration in precipitation throughout the United States for the period 1963-1966 are presented. Acidity is the highest in the northeastern states, ranging from 4.2-5.1 as compared to typical pH values of 5.7 in unpolluted air of maritime origin. Pacific coastal values of 5.8 at Neah Bay, Washington and 5.9 at Catalina Island off the cost of California and similar averaged values observed in the southeast at stations in Tampa, Florida, Lake Charles, Louisiana, and Montgomery, Alabama suggest that the rainfall acidity is largely dominated by the influence of carbon dioxide. Precipitation collected at coastal stations and the southeastern states shows pH values as high as 7.3 in contrast to values obtained in the northeast. Generally, precipitation is most acidic during the spring and summer. The pH of precipitation appears to be largely dependent on sulfuric acid (generated by the oxidation of sulfur dioxide) and nitric acid (derived from nitrogen oxides). It is also dependent on such naturally occurring bases as ammonia and carbonates of calcium and magnesium. The relative alkalinity of the semi-arid and arid west appears to be due to very high concentrations of calcium associated with carbonate in soil dust. (Author abstract modified)

50892 **APTIC NO. 69916**

Lyzenga, David R.

ENVIRONMENTAL EFFECTS OF AIRCRAFT CONDENSATION TRAILS. *Michigan Univ., Ann Arbor, Dept. of Electrical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-15,791, 1974, 103p. 34 refs.*

An assessment is made of the influence of aircraft condensation trails on the energy budget of the earth s surface and the atmosphere. The radiative properties of a typical contrail layer are computed from Mie scattering and radiative transfer theory, and the effects of the layer on the fluxes of solar and terrestrial radiation are evaluated. The solar and terrestrial radiative properties of the layer are calculated from a physical model which is based on ground-level observations of contrail microstructure, with parallel calculations being made from three values of the particle radius (1, 3, and 10 microns). These radiative properties are used to calculate the net radiation at the top of the atmosphere as well as that at the surface of the earth. The average contrail cover generated over the United States is estimated at about 35,000 sq km or about 0.5% of the land area. Locally, near airports and heavily traveled air corridors, the average contrail cover is probably about 5%. A continuous contrail cover is estimated to cause a decrease in the earth s surface temperature of about 2 C over dry land at mid-latitude or a decrease in the evaporation rate of 0.4 mm/day over wet soil or water. The conclusions are tentative since not enough is known about the dynamics of the atmosphere to confidently predict the effects of arbitrary perturbations.

50893 **APTIC NO. 70744**

Melo, Octavio T. and Colin R. Phillips

AMBIENT OXIDANT MEASUREMENTS AT TORONTO, CANADA. *Atmos. Environ., 8(11):1195-1201, Nov. 1974. 18 refs.*

Ground-level ambient oxidant concentrations monitored at Toronto, Canada during 1970 and 1971 are discussed in terms of meteorological conditions, seasonal and diurnal variations, and measurements of other pollutants in the vicinity. During the 2-year period, more than 100 hourly concentrations in excess of the Provincial standard of 10 pphm were observed. High oxidant concentrations during the summer months appeared to result from photochemical reactions since they were accompanied by daily fluctuations of primary and secondary pollutants characteristic of photochemical activity. The summer month diurnal patterns were characterized by nitrogen oxide peaks during the morning rush hour and oxidant peaks in the afternoon. During the early winter, the oxidant peak was much less pronounced. Simultaneous analysis of oxidant monitoring data and continuous meteorological records showed that high oxidant concentrations occurred on days of high temperature, long solar irradiation periods, and southerly winds. Sources south of Toronto appeared to have been responsible for the oxidant precursors. (Author abstract modified)

50894 **APTIC NO. 73060**

Meyer, J. H., T. W. Eagles, L. C. Kohlenstein, J. A. Kagan, and W. D. Stanbro

MECHANICAL-DRAFT COOLING TOWER VISIBLE PLUME BEHAVIOR: MEASUREMENTS, MODELS, PREDICTIONS. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 307-352, 1975. 17 refs. (March 4-6.)*

Field studies of visible plumes from mechanical-draft cooling towers serving a steam electrical power plant are being performed to obtain data for the prediction of the potential effect of cooling tower emissions and for model development and tuning. Data are being collected on plant operating characteristics, plume exit temperature and velocity profiles, local meteorology, and visible plume behavior. Data collected over the fall and winter of 1973-1974 are being used to define and tune models of the rise and extent of plume visibility. The use of this data to tune currently existing buoyant bent-over plume-rise formulations yielded an accurate method for predicting visible plume length; plume trajectory, however, was best predicted from the rise of a single-cell model in contrast to plume visibility which was best handled by assuming entrainment into all seven cells. Initial results from a model that numerically integrates the conservation equations over the complete plume trajectory and includes multiport plume geometry transitions provide fairly accurate predictions of plume trajectories based on the exit conditions and entrainment of all seven cells, suggesting that dramatic plume dilution rates are prevalent during initial stages of plume rise and merger and that plume bend-over does not always occur rapidly. (Author abstract modified)

50895 **APTIC NO. 71160**

Molina, Mario J. and F. S. Rowland

SOME UNMEASURED CHLORINE ATOM REACTION RATES IMPORTANT FOR STRATOSPHERIC MODELING OF CHLORINE ATOM CATALYZED REMOVAL OF OZONE. *In: Fluorocarbons - Impact on Health and Environment. 93rd Congress (House of Representatives), Second Session, Rept. H.R. 17577, H.R. 17545, Serial 93-110, p. 39-46, Dec. 11-12, 1974. 18 refs. (Hearings Before the Subcommittee on Public Health and Environment of the Committee on Interstate and Foreign Commerce.)*

GPO

Sources of hydrogen in the stratosphere were estimated. The most abundant H2-containing species, are, in order of decreasing abundance, water, methane, H2, hydrogen peroxide, nitric acid, HO2, and hydroxide. Hydrogen abstraction by chlorine atoms is endothermic by 10 kcal/mol with H2O, and is therefore of negligible importance at stratospheric temperatures. The approximate rate for formation of hydrogen chloride by reaction with each of the five possible species between 25-55 km were calculated.

50896 **APTIC NO. 70319**

Nakamura, Ken and Yutaka Tanaka

SIMULATION FOR CALCULATION OF CO CONCENTRATION AROUND STREET. *(Doro shuhen no CO nodo no keisan). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):492, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Nov. 6-8, 1974, Chiba, Japan, Paper 338.)*

For the calculation of simulated carbon monoxide concentration in the vicinity of a road, the ideally structured road (sufficient space left at roadside) with an intersection and tunnels on both sides of the intersection was hypothesized, which was considered to have a good ventilation rate. The data obtained at Hibiya and Shinagawa intersections with similar structural characteristics were used for calculations, which were then applied to the calculation of CO concentration distribution at hypothetical points. The Puff model was used for diffusion calculations. The calculation result of Hibiya and Shinagawa intersections gave a 99% value, and therefore the value of simulated calculation was also considered to be a 99 % value.

50897 **APTIC NO. 68969**

Nakane, Yoshiichi, Shozaburo Ishido, and Takeji Miyazaki

ALTITUDE DISTRIBUTION OF SO2 CONCENTRATION IN OHBAYASHI BUILDING. *(Ohbayashi biru ni okeru SO2 nodo no kodo bunpu). Text in Japanese. Preprint, Japan Society of Architecture, p. 161-162, 1974. (Presented at the Japan Society of Architecture, Hokuriku District, Scientific Lectures, Japan, Oct. 1-3, 1974, Paper 4081.)*

The vertical distribution of sulfur dioxide concentration was measured to obtain information for the determination of position and direction of air inlet for a skyscraper. The SO2 concentration was measured by the alkali filter paper method at Ohbayashi Building in Osaka from June 27, 1973 to Jan. 31, 1974. On the east side of the building, the SO2 concentration peak was at the 6-14th floor level; however, no particular peak was observed on the west side. The SO2 concentration generally decreased with height and was lower on the west side. To investigate the variation in vertical SO2 concentration distribution with time and meteorological conditions, the SO2 concentration (electroconductometric method) and temperature were measured from Nov. 2 to Dec. 12, 1973. On a typical high SO2 concentration day, the formation of temperature inversion was observed between the 19th and 29th floor. The relationships between SO2 concentration and temperature decrease rate, wind direction and wind velocity were also analyzed, indicating that the SO2 pollutant sources were located on the east side.

50898 **APTIC NO. 70610**

Narikawa, Jiro

THE CHARACTERISTICS OF WIND DIRECTION AND WIND VELOCITY IN THE OSAKA PLAIN AND PROBLEMS IN FORECASTING SMOGS. *(Osaka heiya no fuko, fusoku no tokusei to sumoggu yoho no mondaiten). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), no. 15-2:29-36, 1974.*

In the dilution of atmospheric pollutants by diffusion, the altitude of the layer in which the diffusion occurs due to vertical temperature distribution, and the average wind velocity in the layer are two important parameters. The characteristics of wind direction and wind velocity in the Osaka plain are analyzed with regard to the geographical characteristics, diurnal variation in land and sea breezes in the summer and winter, and the frequency distribution of average wind velocity. For the transport or mixing of pollutants, the vertical structure of atmosphere, the formation of inversion layer, and wind characteristics in, at, or above the boundary layer are important factors. The vertical temperature distribution and vertical wind velocity distribution are analyzed. In the Osaka area, the high pollutant concentration is associated with low wind velocity. For the decrease in pollutant concentrations by the transport pollutants with wind to occur, high wind velocity is important. Four methods of forecasting maximum wind velocity are described. The forecasting methods for fog formation using the upper chart (500 mb and 850 mb) and surface chart are also described.

50899 **APTIC NO. 73023**

Neligan, R. E.

EMISSION TRENDS AND POLLUTANT TRANSPORT. *Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., (Solvent React. Conf. Proc., Research Triangle Park, N. C., 1974), EPA-650/3-74-010, p. 5-12. (Nov.)*

The long-distance transport of hydrocarbons and its effect on ozone concentrations were studied at four rural areas in the midwestern United States. Both ground monitoring data and aircraft sampling data were obtained for oxidants. Mean hourly ozone concentrations ranged from 105-149 micrograms/cu m, and mean hourly nitrogen dioxide concentrations ranged from 11-21 micrograms/cu m. Estimated hydrocarbon emissions from both mobile and stationary sources are tabulated for various cities along with the relative contribution of each source type for the years 1970 and 1990.

50900 **APTIC NO. 70682**

Nihei, Akira, Miyo Kaneko, Seiko Takahashi, and Hideki Kagaya

CALCULATION OF AIR POLLUTION LOAD BY COMPUTER. *(Taikiosen fukaryo no keisan ni tsuite). Text in Japanese. Miyagiken Kogai Gijutsu Senta Hokoku (Miyagi Prefect. Pollut. Contr. Tech. Center Rep.), no. 2:3-13, April 1974.*

The sulfur dioxide pollution map in Miyagi Prefecture was simulated by computer using of the method submitted by the Pollution Counter-measuring Committee of the prefecture. The following diffusion equation was obtained from a modification of the regular diffusion equation. The function C(r,H) equals (11.312Q/sq root(cu pi).r.(sigma) Z.U)) exp(sq H/2 sq(sigma) Z), where C was concentration of SO2; Q, emitted amount of SO2; r, coordination along wind direction; U, wind velocity; (sigma)Z, standard deviation of concentration distribution along z(vertical) direction; and H the effective chimney height. H and (sigma)Z were estimated from the Bosan-quetle equation and the Pasquill relation. Substituting H and (sigma)Z into the above relation, the concentration of SO2 was calculated. The function CU/Q defined as F(r) expressed the degree of pollution. Thy mean value of F(r) in unit distance of (delta)r was computed from the relation (integration of F(r) from r1 to r1 + (delta)r)/(delta)r). The pollution load in one wind direction of 16 divisions at distance r was then obtained from the relation that Mr equaled (Q.W (theta) mean of F(r)/(summation of F(r) from distance zero to infinity), where W(theta) was the frequency of the wind direction. Miyagi Prefecture was assumed to be a lattice with 2 km square meshes, and the pollution load at each mesh was computed to obtain the pollution load map of Miyagi Prefecture. The degree of SO2 pollution was high in the city area although the pattern of it was slightly different in 1971 and 1972. The pollution load decreased in 1972 from the 1971 value. This might be explained by the fact that number of low chimnies decreased in 1972. The relation between SO2 concentration, Y(ppm), and pollution load, X(ton/yr/4 sq m) was expressed as that Y equals 0.0038 times X to the 0.28 power in 1971 and Y equals 0.0042 times X to the 0.25 power in 1972. The different expressions for the relation between X and Y in 1971 aad 1972 suggests that the method of simulation was not completely established.

50901 **APTIC NO. 73069**

Pena, J. A. and C. L. Hosler

INFLUENCE OF THE CHOICE OF THE PLUME DIFFUSION FORMULA ON THE SALT-DEPOSITION-RATE CALCULATION. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 573-584, 1975. 14 refs. (March 4-6.)*

Salt deposition rates for cooling towers are calculated with three different plume diffusion formulas, two assuming turbulence and one without a turbulence parameter. Each of the models predict the salt deposition rate to within a factor of two; thus, any of the models can be used to obtain useful results. Observational values are not presently available for comparing each of the formulas in terms of their accuracy. Each of the models can be improved by including the effect of natural precipitation and improving data on drift-drop size distribution and total mass fraction drift. (Author abstract modified)

50902 **APTIC NO. 70205**

Peters, L. K.

EXTENSION OF EDDY DIFFUSION PLUME MODELS TO INCLUDE ATMOSPHERIC SCAVENGING PROCESSES. *Preprint, American Inst. of Chemical Engineers, New York, 29p., 1974. 23 refs. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 67th, Washington, D. C., Dec. 1-5, 1974.)*

The extension of eddy diffusion plume models to include atmospheric scavenging processes is described. The Gaussian and eddy diffusion plume models are equivalent in the simplest cases. The eddy diffusion model can be extended to more complex cases on the basis of fundamental and chemical and physical principles without the need for intuitive propositions. This enables atmospheric scavenging processes to be included. Practically every pollutant has one or more sinks operating. Scavenging processes can be classified as either homogeneous or heterogeneous depending on their mathematical, and not physico- chemical form. Both mechanisms decrease the concentration of the emitted species. The following processes are treated: removal of particulates by rain; removal of sulfur dioxide by rain; and removal of SO2 at ground level by a large body of water. (Author abstract modified)

50903 **APTIC NO. 73119**

Peyton, Thomas, Alan McIntosh, and Virgil Anderson

A FIELD STUDY OF THE DISTRIBUTION OF AERIALLY DEPOSITED TRACE ELEMENTS IN AN AQUATIC ECOSYSTEM. I. SEDIMENT COMPONENT. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 193-201. 15 refs. (June 11-13.)*

The distribution of aerially-deposited metals in a man-made aquatic system, viz., a borrow pit, exposed to urban-industrial sources of air pollution was studied. Sediment levels of cadmium, zinc, lead, copper, and iron were 1.82, 481.0, 354.0, 52.1, and 40,524.0 ppm (top 5 cm of core samples) as compared to control values for a rural pond of 0.20 or less, 25.0, 5.0, 10.0, and 6300.0 ppm, respectively. The distribution of the metals in the exposed system was a function of basin depth and slope, point sources, and water currents. The majority of metals were found in aggregate silt fractions, indicating a binding capacity of silt for aerially deposited metal-bearing particulates. (Author abstract modified)

50904 **APTIC NO. 73070**

Roffman, Amiran and Ralph E. Grimble

DRIFT DEPOSITION RATES FROM WET COOLING SYSTEMS. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 585-597, 1975. 12 refs. (March 4-6.)*

Drift deposition calculations are performed for spray canals, mechanical-draft wet cooling towers, and natural-draft wet cooling towers. The calculations account for drift rate, droplet mass size spectra, plume height, dispersion of the droplets, atmospheric conditions, changes in droplet size due to evaporation or condensation, changes in the chemical composition of the droplets, and changes in fall velocities. Drift deposition rates for the same cooling capacity and for a given set of meteorological conditions are highest for spray canals, though the deposition is largely confined to the immediate vicinity of the canal. Natural-draft cooling towers show the lowest drift deposition rate, while mechanical-draft towers show intermediate drift deposition rates. The diffusion model calculations also indicate that temperature and humidity variations exert their largest effect on drift droplets discharged from natural-draft cooling towers. Under neutral atmospheric conditions the total reduction in drift deposition rates due to temperature and humidity variations is about 15-16% at 1000-8000 m downwind. Deposition rates from mechanical-draft towers with the same atmospheric conditions account for about 4-6% at 100-2000 m downwind. Drifts from spray canals experience changes of less than 1%. (Author abstract modified)

50905 **APTIC NO. 70342**

Sakagami, Jiro

DIFFUSION IN THE ATMOSPHERE. *(Taikichu no kakusan). Text in Japanese. Preprint, Japan Society of Instrument and Control Engineers, Yokohama, p. 521-522, 1974. 2 refs. (Presented at the Japan Society of Instrument and Control Engineers, Lecture Meeting, 13th, Yokohama, Japan, Aug. 27-29, 1974.)*

The pollutants released into the atmosphere are carried away by wind and diffused three-dimensionally. There is interaction between flow phenomena and diffusion phenomena. When flow along level ground encounters hills and mountain ranges, the shape of the flow lines changes. Equations and graphs for atmospheric diffusion are included.

50906 **APTIC NO. 73066**

Schrecker, Gunter O., Karl R. Wilber, and Frederick M. Shofner

PREDICTION AND MEASUREMENT OF AIRBORNE PARTICULATE CONCENTRATIONS FROM COOLING-DEVICE SOURCES AND IN THE AMBIENT ATMOSPHERE. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 455-482, 1975. 9 refs. (March 4-6.)*

The sensitivity of drift-particle mineral residue transport calculations to source and meteorological parameters is discussed for natural- and mechanical-draft cooling towers and spray module systems. The ground-level air salt concentration from either source contributions or ambient contributions is a more fundamental parameter for comparison than the deposition rate which is more difficult to measure or predict. Representative and accurate source data on particle density distribution and good meteorological data are required for the prediction of airborne mineral concentrations. Accurate source measurements for large particles are especially important for near-zone considerations; such measurements are critical for particles diameters greater than 100 micron with natural-draft towers, 50 micron with mechanical-draft towers, and diameters greater than 20 micron with spray systems. The accuracy requirements for far-zone considerations are less stringent since small particles are more influenced by atmospheric turbulence than by gravitational effects. Accurate information on the mass emissions associated with these particles is useful for comparison and prediction. Since far-zone source contributions are not appreciably reduced by even complete elimination of large particles, the increased costs and possibly reduced thermal efficiency associated with high-efficiency drift eliminator systems may be counter-productive. Airborne particle samplers can provide accurate sea-salt measurements at detection limits nearly two orders of magnitude lower than those of high-volume samplers. (Author conclusions modified)

50907 **APTIC NO. 73054**

Slawson, Peter R., Jesse H. Coleman, and John W. Frey

SOME OBSERVATIONS ON COOLING-TOWER PLUME BEHAVIOR AT THE PARADISE STEAM PLANT. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 147-160, 1975. 14 refs. (March 4-6.)*

Observations of the time-mean paths and excess moisture of the plumes from natural-draft cooling towers at the Tennessee Valley Authority s Paradise Steam Plant were compared with a one- dimensional model for moist bent-over plume behavior. Most of the plume trajectories observed were adequately described by a 2/3 law, i.e., a 2/3 slope resulted when the observed plume path was plotted on log-log paper. Plume lengths and moisture content were predicted by using a moisture balance equation and elementary psychrometrics; the predicted values agreed well with observations beyond the visible end of the plume. Both visible plume lengths and moisture content appeared to be greatly influenced by tower downwash. (Author abstract modified)

50908 **APTIC NO. 73055**

Taft, James

NUMERICAL MODEL FOR THE INVESTIGATION OF MOIST BUOYANT COOLING- TOWER PLUMES.

State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 180-204, 1975. 8 refs. (March 4-6.)

A computerized, three-dimensional, steady-state model for predicting buoyant cooling tower plume behavior as a function of downwind distance is desceribed. The model, which is Eulerian in its approach, solves an equation set that expresses the conservation of mass, energy, and momentum. The dynamic and energetic effects of moisture are also included along with a heuristic model of fluid turbulence that allows for the specification of a local kinematic eddy viscosity. Input requirements are minimal, and the model is not limited in its accuracy by assumptions of Gaussian distributions or the neglect of one or more of the space dimensions. Excellent agreement is obtained between observations and predicted values generated by the model. (Author abstract modified)

50909 **APTIC NO. 70632**

Tsunoda, Yoshihiro and Taisuke Satsutani

OBSERVATION OF ATMOSPHERIC IONS AND ATMOSPHERIC PHENOMENA IN KOBE AREA: II. *Kobe Daigaku kogakubu kenkyu Hokoku (Mem. Fac. Eng Kobe Univ.), no. 20:251-262, March 1974. 1 ref.*

Results of observations of ion density spectra and aerial local potential are reported for various atmospheric conditions in Kobe, including smog episodes during which human injury occurred. The mean value of minor ion density is generally small and that of total ion great when relative humidity is high, while the mean values of both positive and negative ions increase during violent rain; the latter increasing more than the former. Typhoon conditions result in a small total ion density despite high relative humidity, with the minor ion density being larger due to the rain. The occurrence of photochemical smog conditions results in minor ion decreases and total ion increases, despite fair weather and medium humidity. The range of vision narrows, and the aerial local potential shows a peculiar fluctuation. (Author conclusions modified)

50910 **APTIC NO. 70558**

Whaley, H. and G. K. Lee

PLUME DISPERSION FROM A THERMAL POWER STATION ON THE SHORE OF A LARGE LAKE. *J. Inst. Fuel, 1974:242-250, Dec. 1974. 5 refs.*

The dispersion of multiple plumes from the four 150-meter stacks of a thermal generating station was measured by an aerial probing technique. During the studies, the plant load varied between 1200 MW and 1500 MW, and the bituminous coal fuel contained 2.5% sulfur and 8% ash. The station is situated on the northwest shore of Lake Ontario. Spatial measurements of sulfur dioxide and temperature within the plume were obtained by means of fast- response helicopter- and automobile-mounted instruments. Additional meteorological information was obtained from radiosonde balloon releases. The variations in plume behavior which resulted from meteorological changes during 3 consecutive days in spring are described. The plume parameters derived from measured data are compared with those estimated from published information in the literature. Plume rise calculated from the Briggs equation and the Pasquill standard deviations of plume spread was compared with corresponding data derived from the three-dimensional measurements of buoyant plumes under neutral, inversion, and limited mixing conditions. Under neutral conditions, the derived plume axis elevations, although lower than those estimated by the Briggs equation, showed the same 2/3 power law dependence with downwind distance. For inversion and limited mixing conditions, the derived plume axis elevations eventually leveled off and then approached zero with increasing dimensionless downwind distance from the source. Briggs equation, if applied at these distances, indicated that the plume would remain at a constant ceiling height. Derived standard deviations of plume spread when compared with Pasquill values showed good agreement for neutral conditions and fair agreement for stable conditions. For limited mixing conditions, the wide variation observed in ratios of the lateral to vertical standard plume spread indicated that both spread parameters cannot be assumed to have the same stability class; therefore, a realistic assessment of plume dispersion under a capping inversion can be obtained only from measured data. (Author abstract modified)

50911 **APTIC NO. 65626**

Kanagawa Prefectural Pollution Control Bureau (Japan)

AIR POLLUTION AND METEOROLOGY: THE RELATIONSHIP BETWEEN HIGH OXIDANT CONCENTRATIONS AND THE WEATHER IN KANAGAWA PREFECTURE. *(Taiki osen to kisho: Kanagawa-ken ni okeru okishidanto konodo osen to kisho no kankei). Text in Japanese. Kanagawa ken Taiki Osen Chosa Kenkyu Hokoku (Tech. Rept. Air Pollution Yokohama- Kawasaki Ind. Area), no. 16:77-84, Feb. 1974.*

The days of emergency due to photochemical pollution in Kanagawa in 1972 were one day in April, three days in May, eight days in June, six days in July, eight days in August, three days in September, and two days in October. Among these, June 11 was an alert day in Kawasaki, and the rest were warnings. The highest concentration of oxidant was 0.32 ppm on July 11 in Kawasaki, followed by the 0.29 ppm of July and August 31 in the same city. The rest were between 0.25 and 0.27 ppm. On these days, the weather was either sunny or cloudy: for 55% of the time, it was sunny at 9 am and 3 pm; 13% of the time, sunny at 9 am and cloudy at 3 pm; and for 22% of the time, cloudy at 9 am and sunny at 3 pm. The maximum temperature was 25-29 C for 63% of the time and higher than 30 C for 32% of the time. The visibility at 9 am was generally less than 10 km and at 3 pm, less than 4 km. The wind velocity was less than 3 m/sec, and the wind direction was north to east at 9 am, and east to southwest in the afternoon. The MMD was less than 1000 m for 13 occasions and between 1001 and 1500 m for 14 occasions. The wind velocity at 1500 m was less than 5 m/sec.

50912 **APTIC NO. 68679**

A THREE DIMENSIONAL ANALYSIS OF PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu rittai chosa kekka no kaiseki). Text in Japanese. In: Showa 48 nendo Itto-Sanken Kokagaku Sumoggu Kyodo Chosa Hokokusho (Report of the 1973 Joint Survey of Photochemical Smog in Tokyo and the three Contiguous Prefectures). p. 29-70, April 1974.*

A three dimensional analysis of photochemical smog was conducted covering the greater Tokyo Bay area. The altitudes checked by a helicopter were 500, 700, and 1000 m, and at several locations, the total depth of 200-1500 m was studied. The equipment used were a thermister resistance thermometer, an anemometer, a radiosonde, and a pilot balloon. Ozone was measured by chemiluminescence, sulfur dioxide, by electroconductivity, nitrogen oxides by chemiluminescence, carbon monoxide and hydrocarbons by mylar bag, gas chromatography, and non-dispersive infrared analyzer, and suspended particulates by nephelometer. Pollution by oxidants covered a large area and great depth with the upper limit of the 1000-1200 m altitude. The effects of the atmospheric stability on the ozone distribution by altitude had two patterns: in a weak wind, the lid of an inversion layer and the mixed layer below had an even high concentration, and the layer above the inversion had a low concentration; in a strong wind, a high concentration of ozone appeared near the inversion and the above and below layers had low concentrations. Generally in a weak wind, the O3 concentration at various levels tended to increase; but with the rise of the south wind, the concentration evened out from the lower layer. The upper atmosphere wind direction and the horizontal distribution of O3 showed no clear patterns. The horizontal distribution of ozone at the altitude of

300 m increased in a south wind in proportion to the distance into inland in the direction of northwest.

50913 **APTIC NO. 70588**

Mito Weather Observatory (Japan)

METEOROLOGICAL ANALYSIS AND INVESTIGATION OF PHOTOCHEMICAL SMOG FORMATION IN IBARAKI PREFECTURE. *(Ibaraki-ken ni okeru kokagaku sumoggu hassei no kisho kaiseki, chosa ni tsuite). Text in Japanese. Tokan Gijutsu Nyusu (Tokan Technol. News), no. 35:31-47, Feb. 1974. 7 refs.*

In Ibaraki Prefecture, photochemical smog alarms were issued 27 days in the period from July to Oct. 1972. The oxidant concentration was measured at four points, and meteorological data, wind direction, wind velocity, temperature, and weather, obtained at nearby four locations, were analyzed. The maximum oxidant concentration and average maximum concentration were 0.270 ppm and 0.167 ppm, respectively. The relationship between oxidant maximum concentration and maximum temperature, maximum wind velocity, frequency of wind direction, or inversion layer were analyzed. The alarm days were classified into four types, and the surface chart, wind convergence line, and sea breeze front of each type of pollution day were analyzed. The meteorological data in the upper atmosphere (wind, temperature) were also analyzed according to the four classifications. The probable contributing factors to high oxidant concentrations were the wind convergence lines developed in early morning and the sea breeze fronts which moved northward from the Tokyo area. However, the triggering factor of high oxidant concentrations were south wind from the Keiyo industrial area.

1973

50914 **APTIC NO. 70224**

Armstrong, J. G.

INSTRUMENTATION OF THE GORE HILL T.V. TOWER WITH ANALYSIS OF ONE YEAR S TEMPERATURE DATA AT THREE LEVELS. *Clean Air Society of Australia and New Zealand, New South Wales Branch, Air Pollut Control Instrum., Proc. Symp., Sydney, Australia. 1973, p. 4-1 to 4-17. 2 refs. (Sept. 18, Paper 4.)*

In general, air pollution dispersion in the lower layers of the atmosphere depends on two main meteorological parameters, wind speed and direction throughout the layers and stability of the atmosphere. Instrumentation on the Gore Hill Television Tower designed to sample air temperature (which defines static stability of lower layers at any instant in time) at three levels along with wind speed and direction is discussed. Low level temperature and/or wind profiles can be measured by airborne sensors with a suitable telemetry link to the ground which are either free or in captive flight (such as balloons, kites, kitoons, and model aircraft), instrumented towers, and indirect methods (such as acoustic sounders or lidar). The tower at Gore Hill was instrumented at 10, 50, and 110 m above the base of the tower. Temperature sensing was conducted by sheathed platinum resistance thermometers. Wind direction was measured by three synchrotac potentiometric wind vanes; wind speed was recorded by reed switch anemometers. Inversions of at least 1-hour long occurred on 262 nights, i.e., 73% of the nights of the year. Inversions were practically a nightly occurrence in the cooler months of the year. A malfunction of the wind speed sensors occurred, but data on the Dines Anemograph at Observatory Hill showed that about 70% of the inversions were associated with a wind speed of less than 2.5 m/sec. The wind direction was generally from the west to the northwest.

50915 **APTIC NO. 73130**

Dowell, Kenneth E.

A NUMERICAL SOLUTION TO A MODEL OF UNSTEADY, ADVECTIVE DIFFUSION OF MATERIAL IN THE ATMOSPHERE. *In: Summary Reports - Fellowship in Scientific Computing, Summer 1973. National Center for Atmospheric Research, Boulder, Colo., Facilities Lab., Rept. NCAR-TN/PROC-90, p. 11-32, Dec. 1973. 5 refs.*

NTIS: N74-32635

Numerical solutions to a model of unsteady, advective diffusion of material in the atmosphere are presented. The model incorporates an empirical eddy diffusivity model of dispersion and includes the advection of material by a time-varying wind. The use of height-variable diffusivities in the diffusion model yields more realistic answers than the use of simple constant diffusivities; and, depending on the initial height of the cloud, fourth order estimates of the advection term in the diffusion model yield different, and presumably better, concentration distributions. Timing statistics for assessing the expense of additional computer execution time required a higher order approximation of advection and variable diffusivities are provided in an appendix. (Author conclusions modified)

50916 **APTIC NO. 70895**

Hosler, Charles R. and Herbert Viebrock (Eds.)

FISCAL YEAR 1972 SUMMARY REPORT OF DIVISION OF METEOROLOGY SUPPORT TO THE ENVIRONMENTAL PROTECTION AGENCY. *National Oceanic and Atmospheric Administration, Environmental Research Labs. and Environmental Protection Agency, Research Triangle Park, N. C., Air Resources Lab., Interagency Agreement EPA-IAG-0160(d), NOAA-TM-ERL-41, 88p., May 1973. 69 refs.*

Meteorological research and other projects that the Meteorology Laboratory of the Environmental Protection Agency is conducting are reviewed for 1972. The work was primarily concerned with developing, evaluating, and using conventional air quality simulation models for stable pollutants, as well as initiating research to develop models for chemically active pollutants. The validation of an urban diffusion model that describes the distribution of automotive-generated carbon monoxide was successful. Completed field studies of the large Power Plant Effluent Study furnished data to be used in developing dispersion models that describe sulfur dioxide pollution from power plants. Studies of the natural precipitation washout of SO2 indicated that the reversible absorption-desorption process of SO2 in precipitation must be considered. The development of remote sensing techniques for obtaining meteorological information focused on improving data processing techniques for the Mark II Thermasonde, a millimeter radiometer that can provide data on mixing depths and temperature profiles within the planetary boundary layer. A portable acoustic atmospheric sounding system was developed to provide information on wind and turbulence in the lower layers of the atmosphere. Sunlight observations were made from satellites to assess changes in aerosol optical thickness on a global scale; measurement of scattering in the near infrared may be possible for quantitative measurement of particulates. Effects of atmospheric pollution on the transfer of radiative energy and the climate of the urban boundary layer were studied. A global atmospheric turbidity network has been in operation since 1960. Climatological information on dispersion parameters based on routine rawinsonde observations for the contiguous U. S. was compiled. Studies were also done on ammonia, airport modeling, photochemical dispersion, fluid flow near buildings and street canyons, cooling ponds, and acoustic radar. (Author introduction modified)

50917 **APTIC NO. 72998**

Huff, Floyd A. and John L. Vogel

ATMOSPHERIC EFFECTS FROM WASTE HEAT TRANSFER ASSOCIATED WITH COOLING LAKES (FINAL REPORT). *Illinois Univ., Urbana, Illinois State Water Survey, National Science Foundation Grant NSF GI-35841, 97p., Dec. 1973. 24 refs.*

The potential effects of cooling lakes on weather conditions in the vicinity of large power plants were studied, with particular emphasis on fogging and icing. Three hypothetical cooling ponds (cold, moderate, and hot) were designed to describe the potential of climatic alterations that might be experienced over Illinois and other areas of similar climates. Surface water temperatures ranging from 69-104 F (hot ponds) showed the potential of producing heavy fog over 60% of the time over Northern Illinois and about 40% of the time over southern Illinois during the winter. Calculations for a moderate pond (49-84 F) showed that the major effect season is winter, with a heavy fog potential almost 40% of the time over northern Illinois and 10% of the time over southern Illinois. Heavy fog was initiated less than 10% of the time during all seasons for a cold pond. The potential for ice initiation around a cooling pond was only 13% for the worst possible case, i.e., a hot pond in northern Illinois during January. Modeling experiments indicated that under extreme conditions a cooling pond might act as an initiator of some cumulus during the early part of convective periods. (Author summary modified)

50918 **APTIC NO. 68726**

Ivanov, V. N. and A. Y. Ordanovich

MESOSCALE STRUCTURE OF THE ATMOSPHERIC BOUNDARY LAYER AND ITS INTERACTION WITH SMALL-SCALE TURBULENCE. *Bull. Acad. Sci. (USSR) Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk., SSSR, Fiz. Atmosfery i Okeana), 9(7):685-698, 1973. 9 refs.*

Observational data on the velocity and temperature fluctuation spectra obtained in the ground layer of an unstable stratified atmosphere over periods of 4-5 hours indicate that the spectra can be represented as the sum of a mesoscale process with characteristic times of approximately 1000 sec and a small scale turbulence process of the surface layer with characteristic time scales of approximately 1-100 sec. The mesoscale process is governed by the cellular structure of the boundary layer which under certain conditions is in evidence up to heights of 10 m; while the characteristics of the small scale turbulence vary in quasistationary fashion with respect to the mesoscale variations of the meteorological fields, making it possible to use the Monin-Obukhov similarity theory in describing it. The nonstationary character of the small scale turbulence must be taken into account in the reduction and interpretation of observational data; while the presence of mesoscale inhomogeneities and their influence on the small scale turbulence imposes a minimum observing time requirement, making it necessary to consider displacement in estimating a number of turbulent parameters and terms in the turbulent energy balance equation. A random process model of a transient of the random modulation type is suggested for description of the turbulence in the surface layer under such conditions.

50919 **APTIC NO. 69056**

Martens, Christopher S., Jerome J. Weslowski, Robert C. Harriss, and Robert Kaifer

CHLORINE LOSS FROM PUERTO RICAN AND SAN FRANCISCO BAY AREA MARINE AEROSOLS. *J. Geophys. Res., 78(36):8778-8792, Dec. 20, 1973. 34 refs.*

Instrumental neutron activation measurements of chloride and sodium in aerosols collected by Andersen cascade impactors from Puerto Rico and the San Francisco Bay area were used to calculate Cl loss from the total aerosol mass and loss as a function of particle size. Calculated Cl losses from Puerto Rican samples ranged from 0.18-0.27 micrograms/cu m, representing at 7-25% loss of Cl ascribed to the marine aerosol component. The Cl losses for the Bay area marine aerosol ranged from 0.24-2.78 micrograms/cu m, or from 6% to nearly 90% of the total particulate marine Cl. Increasing loss of Cl with decreasing particle size was observed in all samples. A linear correlation existed between measured gaseous nitrogen dioxide concentrations and total Cl loss in the Bay area samples, indicating a 0.06 micromole/cu m Cl loss per micromole/cu m of NO_2 and suggesting that Cl loss was controlled by the attachment of nitric acid vapor to the sea-salt droplets which lowered the pH and caused the release of hydrochloric acid to the atmosphere. The size dependency of Cl loss can thus be explained by a size-dependent gain of protons resulting from the accretion of HNO_3 vapor on the marine aerosol. A diffusion model based on the accumulation of NHO necessary to balance the loss of Cl as HCl yielded an average time for completion of gas-particle reactions of 19 min, which was in agreement with previous studies; however, the Cl/Na ratio variation with particle size suggested that chemical equilibrium was not reached. Background levels of gaseous NO_2 and sulfur dioxide may account for the narrow range of Cl loss observed in the less polluted Puerto Rican atmosphere. (Author abstract modified)

50920 **APTIC NO. 70851**

Roosen, Robert G. and Ronald J. Angione

POSSIBLE RELATIONSHIPS BETWEEN SOLAR ACTIVITY AND ATMOSPHERIC CONSTITUENTS. *Preprint, National Aeronautics and Space Administration-Goddard Space Flight Center, Greenbelt, Md., p. 239-249, 1974. 13 refs. (Presented at the Possible Relationships Between Solar Activity and Meteorological Phenomena Symposium, Greenbelt, Md., Nov. 7-8, 1973.)*

Correlations between solar and geomagnetic parameters and atmospheric constituents were investigated at the high-altitude desert site. Observed solar brightness, which depends directly on the amount and size of aerosols in the earth s atmosphere, increased with increasing solar activity. Scattered light near the sun also decreased with increasing solar activity. Plots of precipitable water vapor versus the astronomical extinction coefficient, an indicator of the amount of light removed from the direct solar beam by atmospheric constituents, showed a strong correlation between precipitable water vapor and atmospheric attenuation. Since most of the aerosols above the mountain observation point were hygroscopic, the observed correlations between solar activity and aerosol scattering may have been due in part to a change in aerosol size rather than total aerosol amount. Thus, increased solar activity appeared to be associated with a decrease in attenuation due to airborne particulates and possibly with a decrease in the average amount of water vapor in the air above the particular site.

50921 **APTIC NO. 73460**

Rutkowski, J. D.

CALCULATION OF MINIMAL HEIGHTS FOR SOURCES EMITTING SEVERAL TYPES OF POLLUTION. *(Obliczanie minimalnej wysokosci zrodla emitujacego kilka rodzajow zanieczyszczen). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 7(1):55-58, 1973. 4 refs. Translated from Polish by A. Dangel, National Center for Scientific, Technical and Economic Information, Warsaw (Poland), Foreign Scientific Publications Department, 4p., 1974.*

NTIS: TT 73-54096/1

Mathematical formulae for the calculation of the minimal stack height of a source emitting more than one pollutant are presented. It is assumed that if the sum of the maximal concentration of each substance in relation to the value of allowable concentrations does not exceed a given value called the sum concentration, then the stack height is sufficient for adequate dispersion. The value of the sum concentration is generally around unity for most pollutants encountered. Using expressions for the sum concentration, the background concentration of specific pollutants, and the maximal pollutant concentration, an expression is derived for minimal geometric height of the emission source. The expression includes the average wind velocity at the height of the emitting source as well as a coefficient at proportionality that depends on the state of atmospheric perturbation.

50922 **APTIC NO. 73165**

Turner, Robert E.

RADIATIVE TRANSFER IN REAL ATMOSPHERES (TECHNICAL REPORT). *Environmental Research Inst. of Michigan, Ann Arbor, Infrared and Optics Div., National Aeronautics and Space Administration Contract NAS9-9784, Task 4, Rept. NASA CR-ERIM 190100-24-T, ERIM 190100-24-T, 106p., Dec. 1973, 38 refs.*

NTIS: N74-31873

A radiative transfer model is used to investigate the effects of multiple scattered radiation on remote sensing data resulting from the presence of aerosols in the atmosphere. Absorption by gaseous components other than ozone is not considered. Aerosol density at altitudes less than 5 km is quite high and variable in both composition and particle size distribution, and measurements of the atmosphere s spectral optical depth at the altitude of the sensor as well as spectral optical thickness are recommended. Changes in aerosol composition characterized by the imaginary part of the refractive index are capable of considerably altering the single-scattering albedo. Lidar techniques for the measurement of backscatter coefficients are recommended. Extending the radiative-transfer model to include absorption, the spectral path radiance and total spectral radiance are calculated for various degrees of contamination; radiances can change by at least a factor of six between clean atmospheres and strongly absorbing ones. Calculations of singly-scattered surface radiance for a variety of situations indicate that signatures based on an analysis which excludes surface interaction can lead to inaccuracies in the recognition processing of multispectral data. A mathematical expression is also presented for the radiance at any point in the atmosphere where the surface is a non-uniform Lambertian reflector. (Author conclusions modified)

1971

50923 **APTIC NO. 72978**

Machta, Lester

STRATOSPHERIC WATER VAPOR. *Preprint, p. 429-433, 1971. 1 ref. (Presented at Man s Impact on the Climate, 1971, Paper 36.)*

Data on increased stratospheric water vapor near Washington, D. C. over the period 1964-1970 are reviewed along with some possible explanations. A logical explanation for the observed increase of moisture during the period is warmer temperatures at the lower equatorial tropopause; however, temperature data from several equatorial weather stations show no such warming. Another possibility for increased moisture in the stratosphere is direct insertion by rockets and jet aircraft. These injections, however appear to be a very small fraction of the total and do not account for the observed growth. The burning of hydrocarbons (fossil fuel combustion) and releases from cooling towers are other possibilities, although most calculations of the moisture increase from man-made sources diluted into the atmosphere do not produce significant concentration increases. Thus, no plausible explanation for the increase in stratospheric water near Washington, D. C. exists.

50924 **APTIC NO. 73465**

Shaw, R. W., M. S. Hirt, and M. A. Tilley

PERSISTANCE OF LIGHT SURFACE WINDS IN CANADA. *Preprint, Atmospheric Environment Service, Toronto (Canada), 25p., 1971 (?), 4 refs.*

Surface wind data were obtained from 111 Canadian synoptic and aviation weather stations for the period 1957-1966 to study the persistence of light surface winds (less than or equal to 7 mi/hr) and the air pollution potential of given areas. Generally, persistent light winds occurred most frequently in British Columbia, the Yukon, and Northern Alberta. The frequency of occurrence of light winds for the 10 provinces of Canada was at a minimum in the spring and a maximum in the winter. In the Yukon and the Northwest Territories, it was a minimum in the summer and a maximum in the winter. The seasonal variation was least in the mountain-valleys and greatest elsewhere. The spatial and seasonal variation in persistent light winds suggested that topography was a major factor in mountain valleys as opposed to other areas where synoptic weather patterns predominated. Although data for the Arctic was sparse, two locations (Frobisher and Cambridge Bay) showed the occurrence of light winds lasting 24-47 hr which averaged two to four times per winter month; these light winds may contribute to a high pollution potential. (Author abstract modified)

50925 **APTIC NO. 68932**

Van Valin, Charles C.

EFFECTS ON THE STRATOSPHERE OF SST OPERATION. *National Oceanic and Atmospheric Administration, Boulder, Colo., Environmental Research Labs., NOAA-TR-ERL-208-Atmospheric Physics and Chemistry Laboratory-21, 46p., May 1971, 60 refs.*

GPO

Some consequences of supersonic transport (SST) engine emissions on the lower stratosphere are considered. Projected emission quantities of water, carbon monoxide, carbon dioxide, nitrogen oxide, sulfur dioxide, soot, and unburned hydrocarbons are compared with naturally occurring quantities of these substances. There is some present evidence that emissions from the SST will not produce measurable changes in the stratosphere. However, the very restricted knowledge of some stratospheric and operational parameters demands full exploration of the lower stratosphere before commercial use of SST aircraft is achieved. Photochemical phenomena in the stratosphere and troposphere are discussed. (Author abstract modified)

1968

50926 **APTIC NO. 72999**

Ivlev, L. S. and O. M. Surikov

AEROSTATIC MEASUREMENTS OF THE VERTICAL DISTRIBUTION OF THE ATMOSPHERIC AEROSOL. *Probl. Fiz. Atm., no. 6:59-63, 1968. Translated from Russian by Catherine M. Barber, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, Foreign Technology Division, 9p., Aug. 21, 1974.*

NTIS, DDC: AD785114

Impactor measurements of the vertical distribution of atmospheric aerosols were made using balloon launches at altitudes from 3-27 km. The greatest amount of aerosol was found near the isotherm and inversion layers which hamper aerosol spreading by turbulent diffusion and convection. The vertical distribution of aerosol particles with a radius greater than or equal to 0.2 micron was stratified and more complex than Young s distribution. The size distribution of the particles was also more complex, particularly when a small volume of air was analyzed; a second maximum appeared to exist for particles with radii between 2-4 micron. Most of the particles examined appeared oval in shape.

BASIC SCIENCE AND TECHNOLOGY

1975

50927 **APTIC NO. 73110**

Dimitriades, B., G. P. Sturm, Jr., T. C. Wesson, and F. D. Sutterfield

DEVELOPMENT AND UTILITY OF REACTIVITY SCALES FROM SMOG CHAMBER DATA. *Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Programs and Bureau of Mines, Bartlesville, Okla., Bartlesville Energy Research Center, RI 8023, 22p., 1975. 24 refs.*

The reactivities of 19 hydrocarbons known to be prominently present in automotive exhaust and ambient air were measured in a smog chamber. The results agreed well with those obtained in two other chamber of different design, indicating the reliability of the data and smog chamber methodology. These reactivity data along with other data obtained during previous studies were used to develop reactivity scales for hydrocarbons and aldehydes which in turn were used to predict the reactivity of several exhaust samples. The predicted rate of nitrogen dioxide formation agreed reasonably well with values obtained by direct experimental measurement in contrast to predicted ozone yield which did not correlate with experimental measurements. The lack of correlation between predicted and measured ozone reactivity values was attributed to the inappropriateness of the individual component reactivity data, the reactivity classification scheme used, and the linear summation method employed. The presently accepted mechanism of atmospheric photooxidation of organics suggests that more useful data on ozone reactivity can be obtained by testing each organic in a mixture with other appropriately selected organics, or, depending on the intended use of the data, under higher organic-to-NOx ratios than were used in the present study. (Author summary modified)

50928 **APTIC NO. 72956**

Landsberg, A., A. Adams, and J. L. Schaller

CHLORINATION KINETICS OF SELECTED METAL SULFIDES. *Bureau of Mines, Albany, Oreg., Albany Metallurgy Reseach Center, RI 8002, 18p., 1975. 17 refs.*

The reaction kinetics of the chlorination of sulfide minerals and several prepared metal sulfides was studied to assess the process as an alternative to sulfide roasting metal recovery which generates dilute quantities of sulfur dioxide. Sulfides of iron, copper-iron, nickel, lead, zinc, silver, bismuth, arsenic, rhenium, molybdenum, and tungsten were investigated at temperatures of up to 600 C. Only nickel and silver sulfides possessed chlorination rates controlled by parabolic reaction kinetics in the commercially important temperature range of 450-600 C. Chlorination appeared to be a suitable means for processing chalcopyrite, galena, and sphalerite at temperatures sufficient to vaporize the sulfur by-product. (Author abstract modified)

50929 **APTIC NO. 72952**

Leonard, P. A., S. L. Plee, and A. M. Mellor

NITRIC OXIDE FORMATION FROM FUEL AND ATMOSPHERIC NITROGEN. *Preprint, Purdue Univ., West Lafayette, Ind., Combustion Lab., 28p., 1975. 33 refs.*

Atmospheric and subatmospheric pressure methane/air and propane/air flames stabilized on a flat flame burner at equivalence ratios of 0.8 and 1.25 were probed for profiles of temperatures and stable reaction products in a study of nitric oxide formation. The data were converted by the Singh and Sawyer technique to local reaction rates for comparison with prediction of the hydrogen/oxygen partial equilibrium method. The latter method predicted thermal NO formation rates in the post-flame region to within experimenatl measurement error for equivalence ratios of 0.8 and 1.25 and pressures from 2/3 to 1 atmosphere. Profiles in rich flames demonstrated that the region of rapid NO formation occurred approximately 2 mm behind the visible flame. An analysis of subatmospheric pressure CH4/air flames (at the same equivalence ratios) that were doped with ammonia to simulate fuel nitrogen revealed that experimetnal fuel NO formation rates agree favorably with de Soete s empirical overall rates and two approximate methods using H2/O2 partial equilibrium. (Author abstract modified)

50930 **APTIC NO. 70368**

Schwarzbach, Eberhard and Reinhard Templin

SIMPLE OZONE GENERATOR FOR PRODUCING CALIBRATION GAS WITH 10 TO 2000 MICROGRAMS OZONE/CU M. *(Einfacher Ozonerzeuger zur Herstellung von Eichgas mit 10 bis 2000 mikrogramm Ozon/m3). Text in German. Staub, Reinhaltung Luft, 35(1):18-20, Jan. 1975. 11 refs.*

A simple, inexpensive ozone generator, which can be easily made with commerical do-it-yourself materials, gives with untreated laboratory air a reproducible gas containing 10-2000 micrograms 03/cu m. The ozone generator is accomodated in a polyvinyl chloride waste water pipe with a diameter of 10.5 cm and a length of 70 cm. Inside this pipe is a second PVC pipe with a diamter of 7.5 cm. Both pipes have four symmetrically distributed holes for air supply. The holes can be closed by turning the external pipe. A ventilator presses air through the ozone lamp. The concentration is controlled by setting the fan voltage and covering the lamps. Changes of the air temperature between 14 and 21 C, of the relative humidity between 45 and 67%, and of the air pressure between 994 and 1004 mb produced no alterations of the ozone content. No interference by sulfur dioxide or oxides of nitrogen was observed.

1974

50931 **APTIC NO. 70743**

Bauerle, G. L., K. Nobe, and E. P. Koutoukos

NITRIC OXIDE REDUCTION WITH NH3 ON PT IN THE PRESENCE OF OXYGEN. *Atmos Environ., 8(12):1331-1333, Dec. 1974. 6 refs.*

The catalytic reduction of nitric oxide with ammonia on platinum in a flow-reactor-simulated flue gas was investigated. The simulated flue gas contained 1000 ppm NO, 5% water vapor, 3% oxygen, 14% carbon dioxide, and 810-860 ppm NH3 in a nitrogen carrier gas. Conversion of NO reached a maximum between 200 and 250 C, with the NO conversion curve being roughly paralleled up to 250 C by a nitrous oxide production curve. The conversion of NO and the production of N2O tended to level off at NH3 concentrations greater than stoichiometric. Tests made with helium as a carrier gas showed that in the absence of O2 complete conversion of NO to N2O and N2 occurred above an inlet NH3 concentration of about 670 ppm. Nitrous oxide was not produced when the NH3 concentration was greater than the NO concentration. Nitrogen production increased with increasing NH3 concentrations and tended to level off above about 1000 ppm NH3. Nitrous oxide appeared to be a major reaction product in the catalytic reduction of No with NH3 in the presence of O2, with the formation of N2O occurring by the reduction of both NO and O2 with NH3.

50932 **APTIC NO. 73463**

Chao, Jing, Randolph C. Wilhoit, and Bruno J. Zwolinski

GAS PHASE CHEMICAL EQUILIBRIUM IN DINITROGEN TRIOXIDE AND DINITROGEN TETROXIDE. *Thermochimica Acta, vol. 10:359-371, 1974 65 refs.*

The ideal gas chemical thermodynamic properties for nitric oxide, nitrogen dioxide, nitrous anhydride, and dinitrogen tetroxide over the temperature range of 50-5000 K are evaluated by the statistical thermodynamic method using the most recent molecular parameters. The effects of anharmonicity and vibration-rotation interaction are included for NO and NO2, and the contributions due to centrifugal distortion are also included for NO2. The rigid-rotor and harmonic oscillator models are adopted for N2O3 and N2O4 molecules. A higher total pressure favors the formation of the dimer N2O4 from the monomer NO2 in equilibrium mixtures. The equilibrium mixture of N2O3-NO-NO2-N2O4 is thermodynamically similar to that for the NO2-N2O4 equilibrium mixture. The equilibrium concentration of N2O3 is a rather complex function of temperature and pressure and never becomes large at pressures up to a few atmospheres. The effects of temperature and pressure on heat capacities and compositions of the two equilibrium mixtures investigated are illustrated graphically, with the calculated heat capacities and equilibrium constants being in good agreement with available experimental values. (Author abstract modified)

50933 **APTIC NO. 73144**

Crutzen, Paul

ARTIFICIAL INCREASES OF THE STRATOSPHERIC NITROGEN OXIDE CONTENT AND POSSIBLE CONSEQUENCES FOR THE ATMOSPHERIC OZONE. *Stockholm Univ. (Sweden), Dept. of Meteorology, Rept. AP-15, 179/2372, 11p., Feb. 11, 1974. 27 refs.*

NTIS: N7431882

A simple photochemical-dynamical model of the stratosphere is used to calculate the effects of nitrogen oxides on atmospheric ozone. A global increase in the mixing ratio of nitric oxide and nitrogen dioxide by almost 10 to the -8 power is expected from a fleet of 500 supersonic aircraft, with values as high as 6 times 10 to the -8 power considered likely in regions of high traffic intensities. The model calculations indicate that substantial decreases of the total atmospheric ozone are possible. Total ozone concentrations are tabulated for heights between 15 and 50 km under different conditions of NO/NO2 mixing ratio assumptions and for cases with and without vertical eddy diffusion.

50934 **APTIC NO. 73170**

Csorba, Tamas

EVALUATION OF CARBON MONOXIDE, SULFUR DIOXIDE, AND SOOT EMISSION OF DOMESTIC OIL FIRING. *(Szenmonoxid-, kendioxid- es koromemisszio meghatarozasa tuzeloolajok eltuzelesenel). Text in Hungarian. Energiagazdalkodas, 15(6):273-274, 1974. 5 refs.*

Formulas are presented for the calculation of the specific carbon monoxide, sulfur dioxide, and soot emissions from fuel assuming a carbon content of 85.6%, hydrogen content of 13.6%, and a sulfur content of 0.5%. The CO emission generated by 1 kg fuel oil is determined by multiplying the ratio of the CO concentration in the flue gases to the total carbon oxides concentration. The specific SO2 emission is calculated under the assumption that all sulfur present in the fuel converts to SO2. Based on a rather good correlation between the Bacharach number and the soot content, the latter is determined by calculation of the soot concentration in the flue gases, from which the specific soot emission per kg fuel is calculated as a function of air-excess coefficient, as well as of the SO2 and carbon dioxide concentrations.

50935 **APTIC NO. 72967**

Davis, James A., Susan M. Davenport, and Frank Biggs

ON ESTIMATION OF PARTICLE SIZE DISTRIBUTIONS. *Sandia Lab., Albuquerque, N. Mex., Atomic Energy Commission Contract, 25p., Feb. 1974. 9 refs.*

NTIS: SIA-73-0576

A numerical means for estimating the distribution of particle sizes in the atmosphere is presented. The method assumes that a linear probe, to which the particles are opaque, is to scan a subset of a plane within the volume containing the particles. When the probe intersects a particle, it is interrupted for a time proportional to the maximum width of the cross section intersected in the direction of the motion of the probe. Under certain assumptions, the distribution of cross section diameters is written as an integral equation involving the underlying size distribution. The measurement data are used to estimate the distribution of cross sections, and the integral equation is then numerically unfolded to yield an estimate of the particle size distribution. Monte Carlo simulations of the physical experiment are performed for several distributions to demonstrate the numerical technique. (Author abstract modified)

50936 **APTIC NO. 73024**

Dimitriades, B.

THE CONCEPT OF REACTIVITY AND ITS POSSIBLE APPLICATIONS IN CONTROL. *Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., (Solvent React. Conf. Proc., Research Triangle Park, N. C., 1974), EPA-650/3-74-010, p. 13-22. (Nov.)*

The application of reactivity data derived for organic compounds to the control of photochemical oxidant air pollution is discussed. Five reactivity classes are presently established for such organic compounds as hydrocarbons, aldehydes, ketones, alcohols, ethers, esters, amines, amides, and various other nitrogen-containing compounds. The overall percent reduction of ambient organics required for a given level of oxidant control can be calculated using the Environmental Protection Agency s Appendix J (Federal Register) method. Each emission source can then be controlled to a different degree using an equation that relates the degree of total control to the control to be applied on a respective source, the reactivity of the emission mixture from each source, the emission rate, and the required degree of control as calculated from Appendix J. Uncertainties concerning benefits of control and problems in applying reactivity criteria in control depend on the rigor and detail used in applying the reactivity criteria.

50937 **APTIC NO. 70707**

Dobbins, R. A. and T. I. Eklund

APPLICATION OF THE METHOD OF LAPLACE TO THE MEASUREMENT OF HOMOGENEOUS NUCLEATION RATES. *J. Aerosol Sci., 5(5):497-505, 1974. 16 refs.*

The application of the Laplace method to the evaluation of the nucleation integral leads to the formulation of an explicit relationship for the nucleation pulse duration which is primarily a function of absolute temperature and certain of its derivatives evaluated at the instant of the peak nucleation rate. The mathematical technique demonstrates the sudden appearance of condensation in cloud chamber of wind tunnel type condensation experiments. Preliminary tests using hot wire anemometry show that the temperature of the gas in a Wilson cloud chamber reaches a minimum at the time that the droplets make their appearance. The nucleation pulse for water vapor in an argon carrier gas is shown to be an asymmetric curve made up of a slow buildup time and rapid decay time. The technique possesses the potential for providing definitive measurements of nucleation pulse duration, nucleation rate, and an experimental value of the highly disputed pre-exponential factor, provided the exponent is known. (Author abstract modified)

50938 **APTIC NO. 70654**

Fukuhara, Kenji

THE BASE OF POLLUTION FORECASTING. *(Osen yoho no teihen). Text in Japanese. Osaka-Kanku Kishodai Gijutsu Joho (Osaka District Meteorol. Observ. Tech. Inf. Bull.), no. 12:27-33, Aug. 1974.*

The handling of pollution data and pollution concentrations for the accurate expression of pollution should be defined prior to the development of a pollution forecasting technique. The correlation between pollution data and meteorological factors and the validity of forecasting pollutant concentrations based solely on meteorological factors are discussed. The question of representativity is discussed with examples of sulfur oxides concentration expressed as a daily maximum concentration and as a daily average concentration. The concept of the term cumulative effect, frequently used a few years ago, is discussed in terms of the variation in daily minimum concentration, maximum concentration of the day preceding the high pollutant concentration, and the durability of meteorological conditions.

50939 **APTIC NO. 70539**

God, Chr.

CALCULATION OF RADIATION HEAT TRANSFER OF COMBUSTION GASES. *(Berechnung der Strahlungswaermeuebertragung von Verbrennungsgasen). Text in German. Radex-Rundschau (Austria), 974(4):250-273, 1974. 21 refs.*

The meaning and application fields of gas radiation are discussed. Luminous and nonluminous radiation from flames during the construction of industrial furnaces, the characteristics of temperature radiation of gases, calculation of radiation heat exchanges of grey assumed gases and a black or grey environment, and simplifications in differing calculation methods are discussed. The emission of carbon dioxide-water-nitrogen-oxygen mixtures is described. Measurements of CO2 and H2O emissions by various scientists are discussed. Calculation methods, deviations and applications of the calculation function suitable for practical purposes, and calculation of emissions of CO2-H2O- sulfur dioxide and carbon monoxide-methane-nitric oxide mixtures are also reviewed.

50940 **APTIC NO. 70334**

Hashida, Isao and Masato Nishimura

ADSORPTION OF NITROGEN OXIDES ON POROUS VINYL PYRIDINE RESINS. *(Takosei biniru pirijin jushi ni yoru chisso sankabutsu no kyuchaku). Text in Japanese. Preprint, Japan Chemical Society, Sendai, p. 656, 1974. (Presented at the Japan Chemical Society, Fall Meeting, 31st, Sendai, Japan, Oct. 2-5, 1974, Paper 2Q18.)*

Adsorption of nitrogen oxides on various porous vinyl pyridine resins was investigated. The amount of nitrogen oxide adsorption was determined gravimetrically, and the adsorption mechanism was studied with infrared and electron spin resonance (ESR) spectrum analysis. At room temperature, nitric oxide, which has little affinity to resin, is hardly adsorbed on polyvinyl pyridine resin (P-VP). With addition of air, NO is converted to nitrogen dioxide and immediate adsorption occurs. Henry s adsorption isotherm describes NO2 adsorption on P-VP. The relative position with respect to the polymer chain of the nitrogen atom on the pyridine radical influences NO2 adsorbability on the resin. Adsorption values of 170-444 mg/g were obtained. The ESR signals were attributed to radicals formed from ethyl benzene or divinyl benzene, which were included as copolymers in P-VP, upon NO2 adsorption.

50941 **APTIC NO. 73143**

Jaeschke, Manfred

ATTENUATION AND DISPERSION OF SOUND IN A DROPLET-LADEN GAS- MIXTURE. *Max Planck Inst. fuer Stroemungsforschung, Goettingen (Germany), Rept. 5/1974, 22p., July 1974. 32 refs. (Presented at the International Congress on Acoustics, 8th, London, England, July 23-31, 1974.)*

NTIS: N74-32110

A theoretical formulation of the attenuation of sound in a droplet-laden gas mixture is formulated based on the assumption that the wavelength of the sound is large compared with the mean distance between the particles. The vapor and the gas (air), as well as the droplets, are treated as a continuum, with the gas and liquid phase of the system being separately described by the continuity momentum and energy equations. Two limiting cases are considered: first, where only the coupled relaxation processes of the mass and energy exchange are pronounced, with viscous effects playing no role; second, where no exchange between the phases occurs, i.e., damping by solid, non-volatile particles. The damping on submicroscopic ice crystals exceeds the damping on large particles (as in clouds) by more than 3 orders of magnitude. Experimentally observed damping in the frequency range of 1-10 kilohertz appears to be exclusively due to phase change, the formation and condensation of water vapor on particle surfaces, and by heat input into the process, resulting in acoustic energy dissipation.

50942 **APTIC NO. 70564**

Jayanty, R. K. M., R. Simonaitis, and Julian Heicklen

THE INHIBITION OF PHOTOCHEMICAL SMOG--III. INHIBITION BY DIETHYLHYDROXYLAMINE, N-METHYLANILINE, TRIETHYLAMINE, DIETHYLAMINE, ETHYLAMINE AND AMMONIA. *Atmos. Environ., 8(12):1283-1289, Dec. 1974. 5 refs.*

Additional inhibitors for the conversion of nitric oxide to nitrogen dioxide in propylene-NO-oxygen irradiated mixtures were tested at 25 C. These mixtures initially contained about 16 m Torr propylene, 8 m Torr NO, 0.012 m Torr NO2, additive, and enough O2 to bring the total pressure to 100 Torr. The NO2 pressure was monitored photometrically. In the absence of additive, the NO2 pressure first increased with irradiation time reaching a maximum conversion at about 12 min. As the irradiation time increased beyond 12 min, the NO2 pressure dropped. Ten-minute irradiations were done with various amounts of diethylhydroxylamine ((C2H5)2NOH), N-methylaniline (C6H5NHCH3), triethylamine ((C2H5)3N), diethylamine ((C3H5)2NH), ethylamine (C2H5NH2), and ammonia (NH3) added. The NO2 pressure was reduced to 1/2 its value in the absence of inhibitor with 1.5 m torr N-methylaniline, 2.5 mTorr (C2H5)2NOH, 6 m torr (C2H5)3N, 6.0 m torr (C2H5)2NH, 2.2 m torr (C2H5)2NOH, and 2.4 m torr N-methylaniline added. The times for maximum % conversion of NO to NO2 were shifted from the additive absent value of 12 min to 15, 18, 22, and 22 min, respectively. In addition, the % conversion at the maximum was also slightly suppressed with additive present. There was a dark reaction between (C2H5)2NOH and NO2 which followed the rate law - d(NO2)/dt equals k(NO2) ((C2H5)2NOH). The rate coefficient k equals 4.5 times 10 to the -18th cu cm/sec at 25 C was too small for the dark reaction to significantly influence the photochemical inhibition studies. (Author abstract)

50943 **APTIC NO. 70527**

Kitagawa, Tetsuzo

QUESTION TO THE ORIGIN OF PHOTOCHEMICAL SMOG. *(Kokagaku sumogu genin setsu e no gimon). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):166, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, 1974.)*

The 1952 London smog was caused by the accumulated flue gas in the inversion layer at ground level. In the case of Los Angeles, however, the accepted theory is that the oxidant is formed by the photochemical reaction of industrial and automotive exhaust gas accumulated in the mixing layer at ground level. In the analogy to London smog, the exhaust gas should be accumulated in the inversion layer rather than mixing layer where turbulent dispersion is marked. In Los Angeles, the descending inversion layer is formed at the altitude of 500-1300 m almost every day during summer months; however, no inversion layer is formed at ground level. The source of exhaust gas accumulation in the inversion layer in the Los Angeles case is the heavy air traffic; and the oxidant formed in the inversion layer is believed to descend into the mixing layer. The actual measurement of vertical distribution indicated the existence of high ozone concentrations in the inversion layer at the altitude of 1000 m, thus substantiating the *above-mentioned mechanism*.

50944 **APTIC NO. 73026**

Levy, A.

REACTIVITY CLASSIFICATION OF ORGANICS *Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., (Solvent React. Conf. Proc., Research Triangle Park, N. C., 1974), EPA-650/3-74-010, p. 29. (Nov.)*

An examination of oxidant reactivity in relation to solvent reactivity classification reveals that when hydrocarbon/nitrogen oxide ratios are comparable oxidant reactivities are comparable, even when absolute concentrations are varied. The synergism of hydrocarbons and NOx usually exerts a positive effect when the hydrocarbon/NOx ratio is constant. A more rigorous chamber procedure for evaluating solvents is required to generalize solvent reactivity concepts.

50945 **APTIC NO. 73028**

Levy, A.

DEVELOPMENT OF A STUDY PROGRAM (RESEARCH NEEDS). *Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., (Solvent React. Conf. Proc., Research Triangle Park, N. C., 1974), EPA-650/3-74-010, p. 32. (Nov.)*

A research program aimed at updating the current status of organic solvent reactivity is proposed. The principal objectives of the program are to correlate the photochemical smog reactivity of organic solvents with their chemical structure and to broaden current knowledge on the influence of various parameters on solvent reactivity. A new reactivity procedure that allows for the evaluation of a solvent under a variety of conditions by the simultaneous irradiation of several systems in a multi-chamber facility is suggested.

50946 **APTIC NO. 70715**

Liu, Benjamin Y. H. and David Y. H. Pui

ELECTRICAL NEUTRALIZATION OF AEROSOLS. *J. Aerosol Sci., 5(5):465-472, 1974. 24 refs.*

The possibility of reducing the level of charge on particles produced by laboratory aerosol generators using a bipolar ionic atmosphere was investigated theoretically and experimentally. The degree of neutralization appeared to depend on the product of the ion concentration and the neutralization time. For particles in the 0.001-100 micron (diameter) range, the maximum value for the above product was estimated at 6 million ions/ml (sec) for cases where the particle radius was much greater than the mean free small ion path and 100,000 ions/ml (sec) for cases where the particle radius was much less than the small ion mean free path. Experimental studies on four radioactive krypton-85 neutralizers with activities of 0.5, 1, 2, and 10 millicurie showed maximum aerosol flow rates of 14, 17, 23, and 107 l/min, respectively, for an ion concentration-neutralization product of 6 million ions/ml (sec). The equilibrium ion concentration ranged from 1.2 million to 8.8 million ions/ml. Investigations with monodisperse aerosols (2.53 micron diameter) generated from dioctyl phthalate showed that charged aerosols can be effectively neutralized by krypton-85 neutralizers and that the kinetics of the charge neutralization process can be predicted with good accuracy from classical ion diffusion theory. (Author abstract modified)

50947 **APTIC NO. 68462**

Marcoaldi, C. A., R. Tarli, and S. Zanelli

PREDICTING AND MEASURING FUEL OIL-GENERATED POLLUTANT CONCENTRATIONS. *(Predizione e misure delle concentrazioni di inquinanti prodotti da oli combustibili). Text in Italian. Chim. Ind. (Milan), 56(1):13-18, Jan. 1974. 12 refs.*

The dynamics and mechanisms of the formation of carbon monoxide, carbon dioxide, sulfur dioxide, sulfur trioxide, and nitrogen oxides during the combustion of fuel oil was studied on a test stand, and related calculations were performed on the basis of Zeldovich model. The gas chromatographic method was applied to the determination of CO2, CO, oxygen, nitrogen, and SO2, while nitrogen oxides and SO^3 were determined by chemiluminescent and condensation methods, respectively. The axis of the combustion chamber was identified as the site of reactions yielding SO^3 and nitrogen oxides. The SO^3 concentration increased along the flue gas duct in the flue gases. The nitrogen oxides and SO^3 concentrations were a function of the operating conditions, and in good agreement with calculated values. These concentrations were strongly dependent on the temperature occurring in the oxidizing zone of the flame.

50948 **APTIC NO. 72991**

Martinez, Maria Ramos, Donald J. Miller, and Ronald I. Thommarson

AUTOMATED ESTIMATION OF KINETIC RATE PARAMETERS AND MECHANISMS OF COMPLEX GAS-PHASE CHEMICAL REACTIONS. *McDonnell Douglas Astronautics Co., Huntington Beach, Calif., Engineering Div., Army Contract DAAD05-73-C-0503, Rept 135, MDC G5012, 322p., Jan. 1974. 44 refs.*

NTIS, DDC: AD774304

Computerized techniques are developed and used to evaluate the specific kinetic properties of molecules and to define various chemically reacting systems of environmental significance. Arrhenius rate parameters are calculated for over 100 simple fission, atom transfer, and hot molecule reactions. The data are then used to model the rates and to establish the mechanisms of the thermal decomposition of ethane, propene, carbonyl compounds, and nitroethane, as well as the oxidation of methane. As many as 30 elementary reactions are used in the reaction simulation analyses, and concentration rate time histories are computed for each species represented in the mechanism scheme. The effective rate coefficients and kinetic order of some of the reactions are also determined from the basic data which are interpreted and correlated with experimental findings. (Author abstract modified)

50949 **APTIC NO. 70640**

Mori, Kenji, Kei Utsunomiya, Kazuya Soga, Katsunori Shimazaki, Yutaka Mito, and Mamoru Aoki

THE EFFECTS OF WATER IN CATALYTIC REDUCTION OF NITROGEN OXIDES. *(Sanka chisso no sesshoku kangen ni okeru mizu no eikyo). Text in Japanese. Preprint, Japan Society for Chemical Engineering, p. 76-78, 1974. (Presented at the Japan Society for Chemical Engineering, Hokuriku Meeting, Toyama, Japan, July 17, 1974.)*

Catalytic reduction was carried out for a sample gas containing 0.54% nitric oxide, 2.2% carbon monoxide, 8.6% moisture, and 88.66% helium on several alloys. The reaction temperature was gradually increased from room temperature to 800 deg and the reaction gas was sampled at given intervals. Nitrogen, hydrogen, and unreacted NO and CO were analyzed by gas chromatography; ammonia was absorbed by water and titrated with hydrogen chloride. For this NO-CO-H2O system, NO disappeared at higher temperature compared to a previous NO-hydrogen system. However, the distribution of NH^3 and nitrogen was similar. The NO disappearing temperature was extremely high on the nickel-copper-chromium catalyst. Ammonia was formed as NO was reduced, and H2 was formed when NO disappeared. Moisture deteriorated the catalyst but contributed to the reduction of NO through the formation of H2 with CO. The catalyst surface reduced by CO was necessary for the reduction of NO. The 100% NO conversion temperature was 520 deg for nickel-copper cobalt, 605 deg for Ni-Cu-iron, and 700 deg for Ni-Cu-Cr catalysts.

50950 **APTIC NO. 72993**

Moseley, J. T., R. A. Bennett, and J. R. Peterson

PHOTODISSOCIATION OF CO3 (INTERIM REPORT). Stanford Research Inst., Menlo Park, Calif., Army Contract DAaHCO4-73-C-0016, Program element RDT and E 1T061102B53A, RDT and E 1T162111A116. Rept. 144, 11p., March 1974. 14 refs.

NTIS, DDC: AD 777512

The photodissociation of the carbon trioxide anion into carbon dioxide and the oxygen anion was studied at seven photon energies ranging between 2.35 and 2.71 electron volts using a drift tube mass spectrometer and an argon ion laser. Measurements of the total cross sections for the destruction of the CO3 anion indicated that essentially all of the destruction was due to photodissociation. The photodestruction of the hydrated CO3 anion over the photon energy range of 2.42-2.60 electron volts also studied, and the total cross section appeared to be nearly constant over this energy range. The photodissociation reaction postulated for the anion's destruction involved its dissociation into CO3 anion and water. The type of photodissociation studied appears to be relevant in terms of the production of free electrons in the ionosphere. (Author abstract modified)

50951 **APTIC NO. 70302**

Mutoh, N. and S. Okada

CONDITIONS FOR VOLATILIZATION OF MALODOROUS SUBSTANCES FROM WATER. *(Akushu bu shitsu no suichu kara no hassan to sono joken). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):454, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 305.)*

Volatilization of five malodorous substances (hydrogen sulfide, ammonia, methyl mercaptan, trimethylamine, and methyl sulfide) from water was studied. Volatilization was effected from static water, impeller-stirred water, and water stirred by passage of nitrogen gas. The temperature of the water was varied from 10-40 C at 10-degree intervals, and the pH of the water was varied from 6.8-8.6. Volatilization of H2S, NH3, and (CH3)3N is highly dependent on pH. Henry's law was followed by ammonia, trimethylamine, methyl mercaptan, and methyl sulfide for static water or midly-stirred water. Hydrogen sulfide, under hard impeller-stirring or passage of gas, exhibited singular exponential values (m) greater than 1 (sometimes 5-6) in the Henry's law relationship, where the gaseous phase concentration of a substance is proportional to a constant times the mth power of its liquid phase concentration.

50952 **APTIC NO. 70708**

Olszyna, Kenneth J., Rosa G. de Pena, Menachem Luria, and Julian Heicklen

KINETICS OF PARTICLE GROWTH - IV: NH4NO3 FROM THE NH3-O3 REACTION REVISITED. *J. Aerosol Sci., 5(5):421-434, 1974. 5 refs.*

The kinetics of the reaction of ammonia with ozone in 1 atm of nitrogen were studied at 25 C to obtain information on the growth of particulate ammonium nitrate by condensation. The NH4NO3 monomer in the vapor phase was mainly dissociated into NH3 and nitric acid, with the latter being continually produced in the reaction and lost by diffusion to the wall with a rate coefficient of about 0.4/min. An induction period occurred initially until the product of NH3 and HNO3 reached 5.8 times 10 to the 27 (molecules/cu cm) squared. At this point, particle production occurred for a short period and then ceased as HNO3 was removed by the particles already present. The HNO3 removal reaction was rate controlling with a rate coefficient of 1.24 times 10 to the minus 6 cu m/min when the NHO3 concentration reached its maximum value. This rate coefficient corresponded to a gas kinetic collision frequency for particles of 84 A in diameter. Diffusional loss of particles was negligible, but the particle density dropped as the run progressed because of coagulation, which proceeded with a rate coefficient of 1.3 times 10 to the -7 cu cm/min. This rate coefficient was within a factor of two of the theoretical collision rate coefficient for a monodisperse system. (Author abstract modified)

50953 **APTIC NO. 70228**

Reifenstein, Edward C., III, Robert J. Horn III, and Michael J. Keefe

HACKENSACK MEADOWLANDS AIR POLLUTION STUDY AQUIP SOFTWARE SYSTEM USERS MANUAL (FINAL REPORT). *Environmental Research and Tech., Inc., Lexington, Mass., Environmental Protection Agency Contract EHSD 71-39, EPA-450/3-74-056-f, ERT Doc. P 244-5, 427p., June 1974. 5 refs.*

NTIS: PB 238605/AS

The operational characteristics and requirements of the Air Quality for Urban and Industrial Planning System (AQUIP) software system developed and implemented in the course of the Hackensack Meadowlands Air Pollution Study are described. The AQUIP was developed as a set of techniques, methodologies, data sets and software components which permit urban and transportation planners to evaluate land use plans on the basis of air pollution considerations. The actual implementation of the software system is based upon a set of procedures which makes use of input data sets and model parameter data sets to perform computations using four basic computer programs and to provide tabular and graphical output. The FORTRAN IV source listings of the computer programs as implemented are included.

50954 **APTIC NO. 73079**

Ruch, R. R., H. J. Gluskoter, and N. F. Shimp

DISTRIBUTION OF TRACE ELEMENTS IN COAL. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 49-53, Oct. 1974. 5 refs.*

Complete analyses of 101 coals, mostly from Illinois and a few from eastern and western United States coal fields are reported. Specific gravity separations up to 2.89 were made on four representative coals, and subsequent analyses were performed on the 33 float-sink fractions resulting from the separations. Twenty-three trace elements were determined. Major and minor elements include calcium, chlorine, iron, magnesium, potassium, sodium, silicon, sulfur, and titanium. Trace element volatilities were determined for each sample type, and further analyses were done on the samples which best retained the element to be determined. Washability studies indicate the potential effective removal of several trace elements including zinc, cadmium, and lead from raw coals by conventional specific gravity methods. Other elements including barium, boron, beryllium, and germanium, are not removed by these methods because a large portion of each is in organic combination. (Author abstract modified)

50955 **APTIC NO. 70711**

Sinclair, David, Richard J. Countess, and George S. Hoopes

EFFECT OF RELATIVE HUMIDITY ON THE SIZE OF ATMOSPHERIC AEROSOL PARTICLES. *Atmos. Environ., 8(11):1111-1117, Nov. 1974. 19 refs.*

In situ measurement of the growth of atmospheric aerosol particles (about one-tenth the size of particles which dominate atmospheric light scattering) with increasing relative humidity (0-98%) were made with miniature diffusion batteries and a continuous flow condensation nuclei center. Particle size distributions computed from the battery measurements were log normal. The number median diameter increased twofold from 0.018 to 0.036 micron over the range of humidity investigated.

The range of geometric standard deviation for the particle size distributions was 1.53-2.06, with the larger number median diameter having the smaller geometric standard deviation. This indicates that the smaller particles grow proportionately more than the larger and that the total respiratory deposition of small hygroscopic material will decrease during periods of high humidity. (Author abstract modified)

50956 **APTIC NO. 73166**

Slanger, Tom G.

CO2 PHOTODISSOCIATION AND VIBRATIONAL EXCITATION IN THE PLANETARY ATMOSPHERES (FINAL REPORT). *Stanford Research Inst., Menlo Park, Calif., National Aeronautics and Space Administration Contract NASW-2400, SRI Proj. PYU-2372, MP 74-27, 69p., July 5, 1974, 76 refs.*

NTIS: N74-32252

Results from studies of carbon dioxide photodissociation and the electronic-to-vibrational energy transfer in systems comprising the atomic oxygen specie O(1D) and carbon monoxide as well as O(1D) and nitrogen or carbon dioxide are presented. The photodissociation quantum yield of CO_2 in the 1200-1500 A region appears to be wavelength-dependent, with quantum yields varying from 0.2-0.8. The data fit the interpretation of stable CO_2-bound states mixed with repulsive or predissociating states since the low quantum yields coincide with the maximum structure in the CO_2 absorption spectrum. A quantum yield for CO production of unity is generally assumed for photochemical studies using CO_2 as an actinometer in the vacuum ultraviolet region, and a change in this assumption results in a significant retroactive effect. Measurements of the efficiency of electronic-to-vibrational energy transfer in O(1D)-CO and O(1D)-N_2 systems using ultraviolet resonance fluorescence techniques indicate that in the former case 40% of the O(1D) energy appears in CO vibrations; in the latter case, 33% appears in N_2 vibrations. The O(1D)-N_2 interaction is critical in determining the vibrational temperature of the terrestrial upper atmosphere. Apparent high quenching efficiencies of vibrationally excited CO and CO_2 during infrared studies of O(1D)-CO_2 interaction prevented observation of the infrared signal. However, a value of 50% for the fraction of the O(1D) electronic energy transferred to CO_2 vibrations is reasonable, based on current electronic-to-vibrational energy transfer experiments. (Author summary modified)

50957 **APTIC NO. 70360**

Suzuki, Kenjiro

COMBUSTION NOISE AND UNSTABLE COMBUSTION. *(Nensho soon to fuantei nensho). Text in Japanese. Preprint, Japan Fuel Assoc., p. 48-57, 1974. 47 refs. (Presented at the Japan Fuel Association, Lecture Meeting on Combustion Devices, Tokyo, Japan, Nov. 14-15, 1974.)*

With the development of large and high load combustors, the noise produced by combustors presents important technical problems. The noise in a combustor is caused by the flow phenomena, such as turbulence and Carman vortex, or by the combination of flow phenomena and combustion process. The roar produced by turbulent combustion and the noise produced by pulsation combustion are defined. The pulsation combustion is classified ito acoustical vibration and nonacoustical vibration. The therorectical analysis of acoustical vibration is described with basic equations and is discussed in terms of oscillation condition, frequency of oscillation, and oscillation control and amplitude. The relationship between the pulsation combustion and blow-off phenomonon is also discussed.

50958 **APTIC NO. 73141**

Thomson, G. H.

THE ELECTRICAL CHARGING OF UNIFORM LATEX SPHERES PRODUCED BY SPRAYING AND DRYING. *Australian Defence Scientific Service, Maribyrnong (Victoria), Defence Standards Labs., TN 295, 14p., June 1974, 9 refs.*

NTIS: N74-31713

The electrical charge distribution on 0.5 micron and 1 micron uniform latex spheres was measured immediately after aerosol generation to investigate the degree to which atomization affects the electrical naturel of aerosols generated for filter testing applications. The distribution of the sign of the electrical charge was determined by collecting the particles on aluminum foil placed over condenser plates. Counts for both positively and negatively charged particles were generally within about 10% of each other, suggesting that the aerosols possessed a net zero charge. The smaller sized particles showed a slightly larger proportion of uncharged particles and a lower value of the mean charge per particle (4.8 for 0.5-micron particles versus 5.6 for 1-micron particles). Charge distributions peaked at 1 and 5 charges particle for the 0.5- and 1.0-micron particles, respectively. Significant proportions of particles with high electrical charge were not found, perhaps because of recombination with ions in the air stream between the time of generation and charge measurement.

50959 **APTIC NO. 70709**

Willeke, K., C. S. K. Lo, and K. T. Whitby

DISPERSION CHARACTERISTICS OF A FLUIDIZED BED. *J. Aerosol Sci., 5(5):449-455, 1974, 10 refs.*

Several common dusts were injected into a fluidized bed of spherical, inert, and electrically conducting bronze or nickel spheres, 100-140 micron in diameter, to study the bed s dust dispersion characteristics. The fluidized bed deagglomerated the dust and dispersed most of it out of the bed during the first minute. Comparisons of size distributions measured microscopically from dry samples of aerosols above the bed with size distributions of the feed dust dispersed in liquid showed that for fly ash, coal dust, and classified air cleaner test dust, the bed dispersion was complete. However, the measured size distributions showed some dust classification for intermittent dust injections. The fluidized bed technique merits consideration for industrial stack emission simulation, evaluation of filters, characterization of centrifugal scrubbers, and for basic research on gas-solid forms. (Author abstract modified)

50960 **APTIC NO. 70541**

Yokota, Hisashi, Atsuko Kobayashi, Masataka Sofuku, Kinji Nakano, and Toshio Ohira

THE FORMATION OF OZONE AND PAN BY PHOTOCHEMICAL REACTIONS. *(Kokagaku hanno ni yoru 03 to PAN no seisei nitsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):156, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 9.)*

Formation of ozone and peroxyacetyl nitrate is studied using a fluorinated vinyl bag with low concentration (close to the actual level in the atmosphere) of propylene and nitrogen oxides. Photochemical reaction was stimulated by using a fluorescence and solar light. When the bag was filled with both 1.86 ppm of C_3H_6 and 0.91 ppm NO_x, the ozone production rate was 4.67 ppb/min and the NO diminishing rate was 7.73 ppb/min, using the fluorescence light. When the bag was filled with 1.93 ppm of C_3H_6 and 1.03 ppm of NO_x, the ozone production rate was 3.56 ppb/min and the NO diminishing rate was 8.07 ppb/min, with solar radiation. The maximum ozone production did not depend on the C_3H_6 and ozone concentration ratio. The ozone production rate depended on the initial C_3H_6 concentration in the bag.

1973

50961 **APTIC NO. 69961**

Pastrana V., Andres

KINETICS OF HYDROXYL RADICAL REACTIONS. *Minnesota Univ., Dept. of Chemical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., order no. 74-10,563, 1973, 153p. 52 refs.*

The kinetics of the decay of hydroxyl radicals in the presence of ethylene, propylene, acetylene, 1-butene, and trans-2-butene were studied at approximately 1.0 torr pressure and ambient temperature in a tubular discharge-flow reactor. Hydroxyl radicals were produced by the fast reaction of hydrogen atoms with nitrogen dioxide, and their decay was followed by line absorption photometry at 308.939 nm in an excess of hydrocarbons. The decay of hydroxyl radicals obeyed a pseudo first-order rate law, with the kinetics being first order with respect to all the hydrocarbons. Second order rate constants obtaineed in the study for the reaction of hydroxyl radical with ethylene, propylene, 1-butene, acetylene, and trans-2-butene were respectively: 2.31 times 10 to the -12, 0.49 times 10 to the -11, 1.53 times 10 to the -11, 2.10 times 10 to the -13, and 1.02 times 10 to the -11 cc/molec/sec. The decay of hydroxyl radical did not obey a pure second order rate law in a number of experiments with both hydrogen atoms and NO2 in excess. A pronounced curvature of the second order hydroxyl radical decay plots suggested that hydroxyl radicals were also consumed by a first-order reaction. The measured rate constants were: 3.33 times 10 to the -12 cc/molec/sec for H atoms in excess over NO2 and 1.85 times 10 to the -12 cc/molec/sec for NO2 in excess. The relatively large values of the rate constants for reactions of hydroxyl radical with the olefins studied provided evidence for the important role played by hydroxyl radicals in explaining the rapid conversion of nitric oxide to nitrogen dioxide and the observed consumption rate of these olefins in polluted air. (Author abstract modified)

50962 **APTIC NO. 73164**

Shimizu, Hiroshi, Takao Kobayashi, and Humio Inaba

MEASUREMENT OF RAMAN SCATTERING CROSS SECTIONS FOR GASEOUS MOLECULES. *(Kitai bunshi no raman sanran danmenseki no sokutei). Text in Japanese. Oyo Butsuri (Tokyo), 42(9):889-898, Sept. 1973. 39 refs.*

Pulsed-Raman spectroscopy, conducted with a pulsed nitrogen gas laser, was used to measure Raman scattering cross sections with respect to that of N2 for 15 gaseous molecules at the excitation wavelength of 3371 A. Gaseous molecules studied were: carbon tetrachloride, nitrogen dioxide, sulfur hexafluoride, benzene, sulfur dioxide, nitric oxide, carbon dioxide, carbon monoxide, ethylene, oxygen, nitrogen, methanol, methane, ethanol, water, and hydrogen. Four optical systems (convex lens; cylindrical lens; elliptic cylindrical mirror; and ellipsoidal mirror) were compared. The convex lens system has the highest collecting efficiency for the focused laser beam. A pulse-gate photon counting method was developed to detect extremely low-intensity, pulsed light signals, and performed better than conventional techniques. Results obtained in this study agree with previously published data using visible light sources.

50963 **APTIC NO. 70226**

Tassicker, O. J.

SOME PARAMETERS OF INDUSTRIAL DUST AND SMOG AND NEW INSTRUMENTATION FOR THEIR MEASUREMENT. *Clean Air Society of Australia and New Zealand, New South Wales Branch, Air Pollut. Control Instrum., Proc. Symp., Sydney, Australia, 1973, p. 6-1 to 6-17. 13 refs. (Sept. 18, Paper 6.)*

Some important but less well-known electrical parameters of airborne industrial dusts and smogs and new instrumentation for their determination are described. Some of these less well-known properties are electrical conductivity, dielectric constant, refractive index, electrical breakdown strength of a layer, adhesivity, tendency to agglomerate, and tendency to volatilize. Electrical conductivity can effect the performance of electrostatic precipitators removing fly ashes and other particulates. Dielectric constants are also important in the operation of electrostatic precipitators because of the relationship between the dielectric constant and the adhesion between the layer of deposit and the receiving electrode. Different kinds of aerosol particles can be determined by analysis of their refractive indexes by laser. Adhesion is important because of the adhesion of dusts to the walls of ducts, chimneys, hoppers, and precipitator electrodes. Electrical conductivity can be measured by the MABEL device, dielectric permittivity can be measured by a Kevatron Precipitation Analyzer, refractive indexes can be measured by a Science Spectrum Differential II device, and adhesion can be measured by a Precipifuge.

1972

50964 **APTIC NO. 72990**

Wayne, R. P.

REACTIONS INVOLVING EXCITED STATES OF O AND O2. *Orleans Univ. (France), Summer Advanced Study Inst., Phys. Chem. Upper Atmos., Proc. Symp., Orleans, France, 1972, p. 125-132. 57 refs. (July 31-Aug. 11.)*

Reactions involving excited states of atomic and molecular oxygen are reviewed, with particular emphasis on the photochemical precursors of such reactions. Reactions considered include: the energy transfer from carbonyl compounds or hydrocarbons to O2, the transfer of energy from excited nitrogen dioxide (light absorption at 400 nm) to O2, the reaction of excited O with ozone to yield excited O2 molecules capable of propagating chains at high concentrations, and the reaction of excited O with water to form hydroxyl radicals. The mechanistic routes and well as reaction rate values are examined for the above processes.

1971

50965 **APTIC NO. 73012**

Fraser, David A.

ADSORPTION OF SULFUR DIOXIDE ON PARTICULATE SURFACES (FINAL SUMMARY REPORT). *North Carolina Univ., Chapel Hill, Dept. of Environmental Sciences and Engineering, American Petroleum Institute Proj. S-13, Rept. 4079, 29p., July 1971.*

A closed circuit fluidized bed was used to examine the adsorption of radiosulfur-labeled sulfur dioxide on a number of solid substrates under various conditions and in the presence of other gases such as water vapor, nitrogen dioxide, carbon dioxide, carbon monoxide, and 1-butene. The adsorbents used were glass beads, fly ash, graphite, activated carbon, and a zeolite cracking catalyst. Particular attention was given to low SO2 concentrations representative of ambient levels. Particle sizes employed in the experiment were larger than those usually found in the atmosphere. Sulfur dioxide adsorption always increased as the SO2 concentration in the gas phase increased and as the substrate surface area increased. Attempts to desorb SO2 from the particle surfaces either by heating or by reducing the SO2 partial pressure were unsuccessful. The amount of SO2 adsorbed was generally not significant when the concentration of the gas was less than 5 ppm. The presence of CO and 1-butene increased SO2 adsorption on all surfaces except glass, apparently due to a chemical reaction occurring on the particle surface. Considerable amounts of SO2 were adsorbed at high concentrations representative of stack gas levels. The effect of heavy dust loading (1 mg/cu m of an inert dust such as graphite) on the amount of SO2 reaching the lower regions of the human lung appears to be biologically insignificant. (Author summary modified)

EFFECTS-HUMAN HEALTH

1975

50966 **APTIC NO. 70585**

Buckley, Ramon D., Jack D. Hackney, Kenneth Clark, and Clara Posin

OZONE AND HUMAN BLOOD. *Arch. Environ. Health, 30(1):40-43, Jan. 1975. 30 refs.*

Statistically significant changes were observed in erythrocytes and sera of seven young adult male subjects following a single short-term exposure (2.75 hr) to 0.50 ppm ozone. Erythrocyte fragility increased from 30% (hemolysis) to almost 40%. Red blood cell acetylcholinesterase activity and reduced glutathione level were decreased from about 18 to 15 millimoles/ml blood/min and about 30 to 28 mg/100 ml, respectively. Red blood cell glucose-6-phosphate dehydrogenase and lactate dehydrogenase enzyme activities were increased from about 4.5 to 5.5 micrograms/g hemoglobin/min and about 100 to 115 international units/g hemoglobin/min, respectively. Erythrocyte glutathione reductase activities were not significantly altered. Serum reductase activities were not significantly altered. Serum glutathione reductase activity, however, was significantly increased (from about 14 to 17 milliunits/ml serum/min. Serum vitamin E and lipid peroxidation levels were significantly increased from about 1.6 to 2.1 micrograms/ml serum and 0.07 to 0.12 microgram/ml serum, respectively. Athough the alternations tended to disappear gradually, they were still detectable two weeks following exposure. The observed changes suggest that oxidation is the initial event and that additional changes occur as a result of the system s attempt to compensate for the changes in blood tissue redox potentials. The increased glucose-6-phosphate dehydrogenase and lactate dehydrogenase activities suggest that red blood cell metabolism is stimulated by ozone. Increases in serum vitamin E levels probably result from the adaptive response of the whole organism, involving increased levels of circulating antioxidants.

50967 **APTIC NO. 70584**

Burns, James E. and Fred M. Miller

HEXACHLOROBENZENE CONTAMINATION: ITS EFFECTS ON A LOUISIANA POPULATION. *Arch. Environ. Health, 30(1):44-48, Jan. 1975. 13 refs.*

Plasma hexachlorobenzene levels in a sample of 86 residents living and/or working in an area exposed to the production, transportation, and disposal of hex wastes (hexachlorobenzene and other chlorinated hydrocarbons) were measured and correlated with demographic characteristics, occupational hazards, food sample analyses, and house dust analyses. Plasma levels of the chlorinated hydrocarbon averaged 3.6 ppb in exposed subjects as compared to 0.5 ppb for subjects in control areas. The highest level was 345 ppb in a waste disposal facility worker, while the highest level in the general population was 23 ppb. There was no evidence of cutaneous porphyria by history or skin examination. Males showed significantly higher residues than females (4.71 versus 2.79 ppb); there were no age differences. The correlation coefficient for HCB and coproporphyrin was 0.19 on 120 blood-urine pairs; there was no correlation between HCB and uroporphyin excretion. The lactic acid dehydrogenase levels were higher in exposed individuals, with the correlation doefficient between LDH and HCB being 0.22. Only two food samples out of 48 were positive for HCB. The mean HCB level in household dust samples for the exposed group was 380 ppb as compared to 20 ppb for control households. Chlorinated solvent plant workers were the only subjects whose occupation showed any apparent relationship to HCB levels which were as high as 223 ppb. The HCB contamination in the area appeared to be clearly related to the disposal of hex waste.

50968 **APTIC NO. 70664**

Evans, Michael J., Linda J. Cabral, Robert J. Stephens, and Gustave Freeman

TRANSFORMATION OF ALVEOLAR TYPE 2 CELLS TO TYPE 1 CELLS FOLLOWING EXPOSURE TO NO2. *Exp. Mol. Pathol., 22(1):142-150, 1975. 11 refs.*

The fate of Type 2 cells after they have been divided was studied. Male rats were exposed to nitrogen dioxide to increase the number of dividing Type 2 alveolar cells. Dividing cells were labeled with 3H-YfT (tritiated thymidine) and studied with autoradiographic techniques in the electron microscope for up to 14 days after labeling. Initially most of the 3H-TdR labeled cells were Type 2. However, by 2 days there was a decrease in frequency of labeled Type 2 cells and a large increase in labeled Type 1 cells. The new frequencies of labeled alveolar epithelial cells were stable from 2 through 14 days. This supported the interpretation that Type 2 cells may transform into Type 1 cells. Under the conditions of this experiment, the time for transformation was about 2 days, and duringg this process an intermediate cell type was present. (Author abstract modified)

50969 **APTIC NO. 70665**

Harvey, R. M.

ENVIRONMENTAL FACTORS IN GLUE EAR. *J. Laryngol. Otol., 89(1): 73-77, 1975. 5 refs.*

Schoolchildren 5 to 16 years old were surveyed to determine the incidence of glue ear (exudative otitis media) in children and to determine environmental factors which affected this incidence. All children were referred to the study because of hearing problems. The incidence of chronic secretory otitis media over an 8-year period was compared for city and rural areas and for various areas within the city. Poor living conditions and air pollution appeared to help cause glue ear. An increase in glue ear incidence occurred in both urban and rural areas following a winter in which there was an exceptional incidence of influenza.

50970 **APTIC NO. 70778**

Ito, K. and O. Kono

AIR POLLUTION AND ASTHMA. *(Taiki osen to zensoku). Text in Japanese. Gendai Iryo (Mod. Med. Treat.), 7(2):166-170. Feb. 1975. 13 refs.*

The general prognosis of asthma and the air pollutants which cause mainly bronchial asthma such as sulfur dioxide, nitrogen oxides, and floating dust are described. A 10-year study on chronic nonspecific lung diseases in a representative industrial area, Yokkaichi, where the percentage of bronchial asthmatic patients of all officially recognized patients due to environmental pollution is 36.8, is discussed. The characteristics of Yokkaichi bronchial asthma, such as the short disease period and low positivity of intracutaneal allergen reaction, are described. Bronchial asthma in an air polluted area is more difficult to cure than general bronchial asthma.

50971 **APTIC NO. 70362**

Kagawa, Jun and Toshio Toyama

EFFECTS OF OZONE AND BRIEF EXERCISE ON SPECIFIC AIRWAY CONDUCTANCE IN MAN. *Arch. Environ. Health, 30(1):36-39, Jan. 1975. 7 refs.*

The effects of ozone exposure (9 ppm) and/or pedaling exercise on specific airway conductance were studied in four healthy male volunteers (ages 20-25 yr, 1 smoker and 3 nonsmokers). Specific airway conductance (calculated from measurements of airway resistance and volume of thoracic gas) increased during exercise alone, amounting to a 6.7% mean increase. Ozone inhalation (5 min) without exercise resulted in a decrease in the specific airway conductance of about 5.0% (mean) of the control value during the exposure episode. Specific airway conductance returned to normal after a recovery period of about 15 min. Ozone exposure plus exercise resulted in a decrease of 3.2% of the specific airway conductance during the episode and a 13.4% decrease 5 min after the episode. After a 30-minute recovery period, a decrease of 4.5% of the specific airway conductance was still noted. Ozone at 0.9 ppm thus appears to have adverse effects on respiratory functions when administered in conjunction with exercise.

50972 **APTIC NO. 70387**

Losert, Cestmir, Brona Kysela, and Vaclav Skoda

A MATHEMATICAL MODEL FOR THE LUNG REACTION AFTER DUST INHALATION BY RATS. *(Ein mathematisches Modell der Lungenreaktion nach Staubinhalation bei Ratten). Text in German. Staub, Reinhaltung Luft, 35(1):12-18, Jan. 1975. 8 refs.*

The effects of exposure of animals to both quartz dust and mixed dust (coal particles + 3% quartz particles) was examined. Eight groups of rats were exposed to a constant concentration of dust with stepwise prolonged exposure. The reaction of lung tissue was followed by estimation of the wet lung weight and the amount of hydroxyproline and lung lipid content. A comparison of the reaction of the lung tissue to the inhalation of quartz dust and mixed dust reveals that after exposure to quartz dust the wet lung weight and the hydroxyproline quantity rise rapidly. The lipid and phospholipid quantity is very high, rises until the 12th week following exposure, and drops slightly afterwards. After exposure to mixed dust, the rise of the wet lung weight and the hydroxyproline quantity are less conspicuous. The lung lipids and phospholipids reach a peak shortly after termination of the exposure and drop from then on. A mathematical model of the time course of biochemical changes was derived.

50973 **APTIC NO. 70733**

Maekawa, S.

THE FORMIDABLE STATUS QUO OF HEALTH DISTURBANCE - THE RESULTS OF DAMAGE SURVEY ALONG TOMEI HIGH SPEED MOTOR ROAD. *(Osorubeki kenko hakai no jittai - Tomei kosokudoro ensen ni miru higai chosa). Text in Japanese. Keizai Hyoron (Econ. Rev.), 24(2): 82-93, Feb. 1975.*

There was a surprising miscalculation in planning the To-mei High Speed Motor Road. The actual motor traffic is two to three times greater than expected. The damage by the increase of noise, vibration, and air pollution caused by such increased motor traffic continuously and increasingly afflict the inhabitants who live along the road. According to a survey in 1973 on the inhabitants of two collective housing areas along the road, the increase of respiratory diseases, especially acute and chronic rhinitis was noticeable, possibly due to air pollution caused by auto exhaust. The increased tendency to catch cold, and the tendency of difficulty in curing sickness are sufficient evidence of air pollution damage caused by increased motor traffic on the road.

50974 **APTIC NO. 70728**

Nakamoto, A. and H. Dodo

RESULTS OF MEDICAL SURVEY ON THE EFFECTS OF AIR POLLUTION IN YOSHIJIMA AREA, HIROSHIMA CITY: ON THE RESULTS OF INFANTILE HEALTH SURVEY IN 1973. *(Hiroshima-shi Yoshijima chiku ni okeru taiki osen no eikyo ni kansuru igakuteki chosa - showa 48nendo shoni kenko chosa seiseki ni tsuite -). Text in Japanese. Hiroshima Igaku (J. Hiroshima Med. Assoc.), 28(1): 116-119, Jan. 1975. 2 refs.*

A field of survey was divided into three areas, A, B, and C, A having about 300 m radius, with the dust burning station as a center, B being located to the north of A, and C being located in the place across the river to A. The children younger than 15 years living respectively in A, B, and C who have visited the hospital were the subject of the health survey monitored by 24 physicians and pediatricians. The items studied were chronic bronchitis (showing symptoms longer than 2 months), asthma-like bronchitis (with stridor, however, without dyspnea and cyanosis), asthma, and other diseases which seem especially connected to air pollution. The frequency of visiting physicians in C area decreased markedly compared to 1972. Chronic bronchitis was seen only on 35 children in C area. Asthmatic boys and girls showed the highest frequency of having visited physicians in A area; asthma-like bronchitic boys and girls showed the highest frequency of visiting physicians in B area; and in C area all frequencies were the lowest. Monthly, the highest frequency of visiting physicians appeared in July in A area, however in other months the highest frequency appeared in B area; in C area the frequency was the lowest in every month. There seemed to be another factor which caused the results, other than air pollution.

50975 **APTIC NO. 70735**

Suzuki, T.

INDUSTRY AND ENVIRONMENTAL PROBLEMS FROM NOW ON (3) - CHAPTER I. ENVIRONMENT AND HEALTH. *(Korekarano sangyo to kankyo mondai (3) - I. kankyo to kenko). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(1):24-34, Jan. 1975.*

A historical description is given on human health and environmental problems. Environmental problems include external, internal, and psycho-social problems interrelating around the homeostasis of living things, in this case, mankind. The problem of nitrogen dioxide and infantile asthma is described as an example. The external environment is further divided into technosphere and biosphere, the latter surrounding the former. The treatment of pollutants between the two spheres differs according to the scope (local, regional, national, or international) and to the substance. There is a curve between the disturbance of the homeostatic system and the disability scale. A problem of lead is presented as such a case. Adapatation, the ability to harmonize the environment and mankind, and the ability to adjust the relationship to the neighboring society are discussed. The automatic development of modern science and technology beyond these abilities is considered.

50976 **APTIC NO. 70730**

Tsuchiya, K.

PROBLEMS ON THE SCIENCE OF INTOXICATION DUE TO HEAVY METALS. *(Jukinzoku chodokugaku ni okeru mondaiten). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan J. Public Health), 22(1):3-7, Jan. 1975. 20 refs.*

Recently industrial toxicology has developed to include environmental toxicology. The problems of environmental toxicology are described. The inevitability of extrapolating the results of much higher doses to relatively lower doses, and the inability of determining the exact dose and of quantifying the response are discussed. The dose-response relationship and the biological half-time are explained. Items concerning biological aspects of air pollution include the epidemiological study between lead content of air and lead content of blood in which determination of exact amount of exposure is necessary. A way to utilize the model of metabolism is described.

1974

50977 **APTIC NO. 73485**

Alquier, Jean-Pierre

OPERATION CARBON MONOXIDE LEVELS IN THE BLOOD OF POLICEMEN IN 1973. *(Operation Impregnation oxycarbonee des gardiens de la paix 1973). Text in French. In: Etudes de pollution atmospherique in Paris et dans les departements peripheriques en 1973. Prefecture de Police, Paris (France), Laboratoire Central, 12p., June 1974.*

Systematic measurements of the carbon monoxide levels in the blood of 304 traffic policemen in Paris are described. The mean value of the carboxyhemoglobin level increased from an initial value of 2.25% to 2.68%, i.e., by 0.43%, in the entire group during the exposure to traffic-generated CO. In smokers, the increase from 3.22% to 3.50%, while in nonsmokers, the COHb level increased from 0.72% before duty to 1.39% at the end of the duty. The findings indicate the absence of health hazards due to exposure to CO in the traffic policemen.

50978 **APTIC NO. 73112**

Angle, Carol R., Matilda S. McIntire, and Anthony V. Colucci

LEAD IN AIR, DUSTFALL, SOIL, HOUSEDUST, MILK AND WATER: CORRELATION WITH BLOOD LEAD OF URBAN AND SUBURBAN SCHOOL CHILDREN. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 23-29. 6 refs. (June 11-13.)*

Blood lead concentrations of urban and suburban schoolchildren were compared and correlated with lead in the air, soil, housedust, milk, and water. Blood lead values of urban schoolchildren, all past the age of pica, showed significant correlations with exterior fallout lead as measured in dustfall, soil, and exterior dirt brought into the house but little or no correlation with minor differences in ambient air levels of lead. The blood lead of 35 urban black schoolchildren (ages 10-12 yr) were significantly higher than those for 35 suburban white schoolchildren (21.7 + or - 0.5 versus 17.1 + or - 0.7 microgram%). Dustfall lead was 32.96 mg/sq m/mo in the urban areas and 3.05 mg/sq m/mo in the suburbs as compared to differences in ambient air lead of 0.63 versus 0.29 micrograms/cu m/mo for urban and suburban locations, respectively. Urban soil samples showed lead concentrations of 444 + or - 62 micrograms/g as compared to suburban soil values of 123 + or - 28 micrograms/g. Boot tray samples were also higher in lead content for urban locations. No significant differences for housedust, milk, or water samples were observed between urban and suburban locations. Correlations of 0.49 and 0.23 were found between blood lead values of urban children and yard soil and boot tray dirt, respectively. The soil lead values for the homes of eight urban high school students (blood lead of 16.3 microgram%) were 863 + or - 243 micrograms/g as compared to 89.6 + or 10.8 micrograms/g for the homes of seven suburban high school students (blood lead of 13.1 microgram%). No correlation existed between blood leads and house dust for this group. (Author abstract modified)

50979 **APTIC NO. 72992**

Aronow, Wilbert S.

EFFECT OF CO ON ANGINA PECTORIS, INTERMITTENT CLAUDICATION AND CARDIOVASCULAR HEMODYNAMICS. *Preprint, American Medical Assoc., Chicago, Ill., 8p., 1974. 11 refs. (Presented at the Air Pollution Medical Research Conference, San Francisco, Calif., Dec. 5-6, 1974.)*

Experiments involving the effect of carbon monoxide on angina pectoris, intermittent claudication, and cardiovascular hemodynamics are reviewed. A double-blind study of 10 men (mean age 49 yr) with classical exertional angina pectoris due to angiographically documented significant coronary artery disease indicated that the mean venous carboxyhemoglobin level increased from 1.03% to 2.68% after 50 ppm of CO was inhaled for 2 hr. This increase in carboxyhemoglobin level was sufficient to cause angina pectoris to develop sooner and after less work. The exposure of 10 men (mean age 51 yr) with classic intermittent claudication of the calf or thigh due to angiographically documented occlusive ilio-femoral arterial disease to 50 ppm CO for 2 hr aggravated angina pectoris and intermittent claudication. The mean exercise time until intermittent claudication onset was 174.3 sec during a control period and 144.0 sec after breathing CO. The breathing of 150 ppm CO by eight male cigarette smokers (mean age 51 yr) with severe angina pectoris who needed cardiac catheterization and coronary angiography produced an increase in mean coronary sinus carboxyhemoglobin level of 1.82% and caused a negative inotropic effect on the myocardium. A significant reduction in left ventricular dp/dt, stroke index, and cardiac index and a significant rise in left end-diastolic pressure were also observed.

50980 **APTIC NO. 70353**

Bahrmann, E. and D. Paun

SCIENTIFIC EXPLANATION OF INJURIES BY ACTIVE AND PASSIVE CIGARETTE SMOKING. *(Zur wissenschaftlichen Begruendung des Tabakschadens durch aktives und passives Zigarettenrauchen). Text in German. Deut. Gesundheitsw., 29(43):2017-2022, Oct. 1974. 16 refs.*

The effects of active and passive smoking are reviewed. Health injuries of passive smokers become understandable in view of the fact that cigarette smoke contains in 1 cu cm 10,000 times more dust particles (which are particularly small and thus penetrate far into the lungs) than clean air. The secondary smoke of a cigarette, which is the one inhaled by passive smokers, contains triple the quantity of 3,4 benzpyrene found in the primary smoke inhaled by the smoker and 16 other carcinogenic aromatics and the major part of the nicotine. It causes irritation of the eyes and the nose tissue, headache, cough, nausea, and dizziness.

50981 **APTIC NO. 70519**

Balabajewa, L.

THE FLUORINE IN BONES AND TEETH OF RABBITS WHICH WERE EXPOSED UNDER NATURAL CONDITIONS. *(Der Fluorgehalt in Knochen und Zaehnen von Kaninchen, die unter natuerlichen Bedingungen exponiert wurden). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 20(9):591-592, 1974. 11 refs.*

In Dimitroffgrad, Bulgaria 1500 m from a fluorine emitting chemical combine, 15 rabbits were exposed to the fluorine polluted air for determination of the influence on the fluorine content in bones and teeth. For determination of fluorine in biological material, a modified ion exchange method by Nilsen was used. An aluminum eriochrome zyanine complex was photometrically determined by the method of Kateswarlu. For elimination of possible errors, the fluorine content was calculated in relation to the mineralized ash residue rather than to the mass of dry substance. The results show a clearly higher fluorine content in those rabbits exposed to fluorine polluted air. The measured concentrations were 96.7 mg% F in the bones of the exposed animals vs. 75.2 mg% F in the bones of the control group. In teeth the measured concentrations were 242.1 and 209.2 mg% F. Since the fluorine content in drinking water in Dimitroffgrad is negligible, the higher F concentrations are clearly attributable to atmospheric pollution from the chemical combine.

50982 **APTIC NO. 70512**

Basmadshijewa, K. and K. Dawidkowa

BIOCHEMICAL AND MORPHOLOGICAL CHANGES IN ALBINO MICE WHICH WERE TREATED WITH ARSENIC TRIOXIDE. *(Biochemische und morphologische Veraenderungen an Albinomaeusen, die mit Arsentrioxid behandelt wurden). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 20(9):586-588, 1974. 16 refs.*

The carcinogenic and gonadotropic effect of arsenic trioxide, the arsenic compound found most frequently in atmospheric air, was determined with 40 mice hybrids divided into five groups. Arsenic trioxide was applied subcutaneously in quantitites of 0.22 micrograms/kg to group 1, 2.2 micrograms/kg to group 2, 1200 micrograms/kg to group 3, and 2400 micrograms/kg to group 4. Group 5 was used as a control group. The effect of the pollutant was checked 24 hr after application by determining the DNA and RNA in liver and testes by the method of Zanew and Markow, the soluble protein in liver homogenates by the method of Lauri, and the DNAase-activity in the lysogenic fractions of the liver by the method of Diske-Burtou. The results show that arsenic trioxide reduces the nucleic acid content in the liver and the testes. The quantity of the measured DNA depended on the amount of As_2O_3 which had been applied. Arsenic trioxide also excrted an influence on all other examined biochemical and morphological parameters.

50983 **APTIC NO. 70545**

Basmadshijewa, K.

CHANGES OF THE CONTENT OF HAPTOGLOBIN AND SERUM MUCOIDS IN ANIMALS WHICH WERE TREATED BY APPLYING SOME CHEMICAL SUBSTANCES. *(Veraenderungen des Gehaltes an Haptoglobin und Serummukoiden bei Tieren, die mit einigen chemischen Stoffen behandelt wurden). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 20(9):584-586, 1974.*

For determination of the changes of the content of haptoglobin and serum mucoids under the influence of pharmaceuticals such as cortisone and apamine, of air pollutants such as dust, sulfur dioxide, silica, lead, arsenic, copper and zinc aerosols, of aqueous extracts from toys, as well as of 2 mg ammonia/cu m and 0.1 mg phenol/cu m, experiments with 240 albino rats were performed according to the method of Jayle. The copper melting combine G. Damjanow in the city of Pirdop, Bulgaria emits all the above mentioned air pollutants. Exposure of rats to the natural conditions prevailing in the neighborhood of this plant revealed the following changes of biochemical parameters: increased discharge of delta-aminolevulinic acid in the urine, decrease of the sulfhydryl groups in serum, and decrease of catalase, peroxidase, and cytochrome oxidase activity in liver. Three-month exposure to the air pollutants emitted by the copper melting combine yielded a reduction of both haptoglobin and serum mucoids.

50984 **APTIC NO. 73124**

Bernstein, David M., Theo J. Kneip, Michael T. Kleinman, Roy Riddick, and Merril Eisenbud

UPTAKE AND DISTRIBUTION OF AIRBORNE TRACE METALS IN MAN. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 329-334. 8 refs. (June 11-13.)*

Tissues obtained at autopsy of New York City residents (20-40 yr in age) were analyzed for cadmium, chromium, copper, iron, manganese, nickel, lead, and ziinc to study the uptake of trace metals due to inhalation exposures of an urban population and to determine the distribution and transfer coefficients of these metals to other organs. Tissue concentrations were determined for the right lung, hilar lymph nodes, kidney, liver, vertebrae, and blood of each subject. Estimates of the deposition and clearance of each metal in the human lung were predicted with a compartmental model, using data on trace metal concentrations in New York City aerosol to determine the coefficients of differential equations in the model. A direct correlation appeared between trace metal content of New York City air and that found in the lungs and lymph nodes of the city s residents. Biological half times for the metals suggested by the International Commission on Radiological Protection Task Group on Lung Dynamics were confirmed by the model which also predicted accurately metal concentrations in lymph nodes as a result of long-term exposure and clearance from the lungs.

50985 **APTIC NO. 70633**

Colley, J. R. T., W. W. Holland, and R. T. Corkhill

INFLUENCE OF PASSIVE SMOKING AND PARENTAL PHLEGM ON PNEUMONIA AND BRONCHITIS IN EARLY CHILDHOOD. *Lancet, no. 7888:1031-1034, Nov. 2, 1974. 10 refs.*

The incidence of pneumonia and bronchitis in 2205 infants over the first 5 years of life was statistically correlated with the smoking habits and respiratory symptoms of their parents. Incidence of pneumonia and bronchitis during the first year of life was directly correlated with the parents smoking habits, being the lowest where both parents were nonsmokers and the highest where both parents smoked. Exposure of the infants to cigarette smoke during the first year doubled the risk of an attack of pneumonia or bronchitis. Over the age of 1-year, the association between the parents smoking habits and the incidence of pneumonia or bronchitis in infants was not consistent. A close association was found between the parents respiratory symptoms and the incidence of pneumonia or bronchitis in children throughout the entire first 5 years of life, independent of the parents smoking habits. Thus, parents cigarette smoke appears to be a serious risk to the infant s health, at least during the first year of life.

50986 **APTIC NO. 70688**

Cox, Doye B.

CADMIUM - A TRACE ELEMENT OF CONCERN IN MINING AND MANUFACTURING. *J. Environ. Health, 36(4):361-363, Jan./Feb. 1974. 9 refs.*

The trace element cadmium is reviewed in terms of natural and industrial sources, airborne levels throughout the United States, the metal s presence in waters, plant uptake, cadmium levels in shellfish, and adverse human effects. Cadmium is found naturally in combination with zinc ore. Industrial sources of the metal include: brass and bronze products manufacturing, electroplating, chemical processing operations, the zinc industry, battery manufacturing, and coal and oil burning operations. Pesticides are also a source of cadmium as are automobile exhaust gases and emissions from tire wear. A total of 2300 tons of cadmium are estimated to have been lost to the air in the United States during 1968, with levels ranging from 0.01-0.37 micrograms/cu m in 17 of 58 cities surveyed. Covington, Kentucky, a manufacturing center for brass and bronze products, shows the highest yearly mean concentration (0.05 micrograms/cu m). Cadmium concentration in growing plants is a function of concentration in the soil. Levels of 10 ppm in the soil appear capable of causing drastic reductions in the yield of wheat and rice. Shellfish contain the highest food concentrations of cadmium (as high as 3.66 ppm for oysters). The chief health problems associated with cadmium include: hypertension, emphysema, and chronic pulmonary disorders. Others include: renal tubular disorders, anemia, liver damage, and testicular destruction. The metal is also linked with malignant tumors in rats, though there is no conclusive evidence for linking with metal with human cancer. Osteomalacia and emphysema are observed in industrial workers exposed to cadmium.

50987 **APTIC NO. 70637**

Ginsberg, Myron D. and Ronald E. Myers

FETAL BRAIN DAMAGE FOLLOWING MATERNAL CARBON MONOXIDE INTOXICATION: AN EXPERIMENTAL STUDY. *Acta Obstet. Gynec. Scand., 53(4):309-317, 1974. 23 refs.*

Techniques of fetal monitoring, including fetal blood sampling in utero, were employed to study the physiological effects of acute maternal carbon monoxide intoxication on nine term-pregnant female rhesus monkeys exposed to 0.1-0.3% inspired carbon monoxide over 1-3 hr. The mothers tolerated carboxyhemoglobin levels exceeding 60% without clinical sequelae, whereas the fetuses promptly developed profound hypoxia upon exposure of the mothers to CO. The fetal COHb levels, however, rose only gradually over 1-3 hr, and thus contributed only slightly to the development of early fetal hypoxia. The fetal hypoxia was associated with bradycardia, hypotension, and metabolic and respiratory acidosis. Severity of intrauterine hypoxia was closely correlated with the appearance of brain damage. Brain swelling associated with hemorrhagic necrosis of the cerebral hemispheres (severe brain damage) appeared only in fetuses whose arterial oxygen content was reduced below 1.0 ml/100 ml for at least 45 min during the maternal CO intoxication. (Author abstract modified)

50988 **APTIC NO. 68942**

Gordon, T. and D. Pistorius

LUNG FUNCTION ANALYSES IN ANIMALS DURING INHALATION OF ZINC OXIDE DUST. *(Tierexperimentelle Lungenfunktionsanalysen waehrend Inhalation von Zinkoxidstaub). Text in German. Zentralbl. Bakteriol. Hyg. Infektionskr. Abt. Orig. A, 227(1-4):116-120, 1974. 3 refs.*

Female Wistar rats grouped according to weight were exposed to 15 mg zinc oxide/cu m air. A first group was exposed 1 hr, a second group 4 hr and a third group 8 hr per day to ZnO for 14, 28, 56 or 84 days. The lung functions of each animal were measured 24 hr after termination of the dust exposure in a plethysmograph. Inhalation volume, frequency, and inhalation time quotient of all animals were within the physiological range throughout the entire exposure time and did not deviate from the control group. The conductance, however, displayed a decreasing tendency during the entire exposure time and was particularly pronounced 4 wk after ZnO exposure. Since the decrease occurred in all animals irrespective of the length of daily exposure, the effect seems to be due to the concentration of 15 mg/cu m rather than to total quantity of dust inhaled.

50989 **APTIC NO. 73125**

Gross, Stanley B. and Emil A. Pfitzer

INFLUENCE OF PATHOLOGICAL CHANGE ON LEAD IN HUMAN TISSUES. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 335-340. 11 refs. (June 11-13.)*

Various tissues from 46 white males (20-84 yr in age) in the Cincinnati area were collected at autopsy and analyzed for lead; pathological conditions altering tissue Pb concentration were examined in particular. Reduced Pb concentrations were associated with osteoporosis in the rib and vertebrae, fatty changes in the liver, and nephrosclerosis of the kidney. Elevated Pb concentrations in the aorta were associated with atherosclerotic disease. Calcification, fatty change, and fibrosis are often observed during the aging process; and these changes in tissues, which occur in normal populations, appear to be important in estimating the significance of Pb body burdens resulting from environmental exposures. (Author abstract modified)

50990 **APTIC NO. 73114**

Hambidge, K. Michael, Philip Walravens, Vijay Kumar, and Chanika Tuchinda

CHROMIUM, ZINC, MANGANESE, COPPER, NICKEL, IRON AND CADMIUM CONCENTRATIONS IN THE HAIR OF RESIDENTS OF CHANDIGARH, INDIA AND BANGKOK, THAILAND. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 39-44. 16 refs. (June 11-13.)*

Hair concentrations of chromium, zinc, manganese, copper, iron, nickel, and cadmium of normal adults, young children, and infants residing in Chandigarh, India and Bangkok, Thailand were analyzed and compared with trace element concentrations for residents of Denver, Colorado. Mean levels of zinc, copper, iron, chromium, and manganese (cadmium not reported) in the hair of young adults living in Chandigarh were 151, 7.1, 7.8, 0.10, and 0.29 ppm, respectively, as compared to levels of 175, 12.9, 19.2, 0.16, and 3.81 ppm for Bangkok residents and 176, 13.7, 3.4, 0.09, and 0.19 ppm for Denver residents. Cadmium concentrations, as well as manganese, iron, and nickel levels, were higher in Bangkok than in the other two areas. The mean levels of zinc, copper, iron, chromium, manganese, and cadmium in the hair of young children and infants in Bangkok were 164, 14.1, 22.7, 0.16, 2.61, and 0.70 ppm as compared with levels of 116, 14.1, 27.9, 0.35, 1.35, and 0.33 ppm for Chandigarh children and infants. The factors responsible for geographical and age-related differences were not determined.

50991 **APTIC NO. 73126**

Hansen, Lee D., Delbert J. Eatough, Larry Whiting, Calvin H. Bartholomew, Coran L. Cluff, Reed M. Izatt, and James J. Christensen

TRANSITION METAL-$SO_3(2-)$ COMPLEXES: A POSTULATED MECHANISM FOR THE SYNERGISTIC EFFECTS OF AEROSOLS AND SO_2 ON THE RESPIRATORY TRACT. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 393-397. 13 refs. (June 11-13.)*

A reaction mechanism for the synergistic effect of metal- containing aerosols and sulfur dioxide on the human respiratory tract is postulated. X-ray photoelectron spectroscopic examination of Pasadena aerosols for sulfite and sulfate reveals sulfite as the predominant form for particles smaller than 2 micron in diameter, indicating stabilization of adsorbed SO_2 in the sulfite form. Stabilization of SO_2 in particulates is postulated to occur via the formation of transition metal-sulfite complexes in which the sulfite is resistant to oxidation by molecular oxygen. The complex then stores the sulfite until the aerosol contacts tissues of the respiratory tract; the formation of organothiosulfates destroys disulfide and sulfhydryl moieties, resulting in the alteration of cellular membranes. Calorimetric, spectrophotometric, and Moessbauer studies demonstrate that stable iron(III)-sulfite and copper(II)-sulfite complexes form both in solution and in the solid state.

50992 **APTIC NO. 73115**

Hopps, Howard C.

THE BIOLOGIC BASES FOR USING HAIR AND NAIL FOR ANALYSES OF TRACE ELEMENTS. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 59-73. 61 refs. (June 11-13.)*

The biological basis for using hair and nails as indicators of trace metal contamination is discussed in relation to their structure and histogenesis and mechanisms by which trace elements are incorporated into these tissues. Topics discussed include: keratinization, hair and nail growth, the exposure of hair and nails to exogenous trace elements in the air, and methods for sample preparation and analysis. Normal concentration ranges for human hair are listed for more than 20 trace elements, including several toxic heavy metal compounds often found in air pollution.

50993 **APTIC NO. 70781**

Imai, N. and K. Abe

INFLUENCE OF AIR POLLUTION ON THE RESPIRATORY SYSTEM. *(Taiki osen no kokyuki ni oyobosu eikyo). Text in Japanese. Kanagawa-ken Koshu Eisei Gakkai-shi (Bull. Kanagawa Prefect. Pub. Health Assoc.), no. 20:3-4, July 1974.*

The results of a survey on the symptoms of respiratory diseases in the inhabitants of the Negishi coastal industrial area in 1965 (before the operation of factories) and in 1972 were compared. the subjects being extracted randomly at 1/50 from inhabitants older than 40 and the method of survey being based on inquiries following the BMRC method. Environmental conditions in both years were almost the same, with 0.03

ppm yearly average sulfur dioxide and about 8 tons dust fall. No large changes were noticed in the constitution of inhabitants during the 5 years in sex, age, occupation, and smoking habit. The results of the comparison, i.e., the change of morbidity of symptoms, were general increases such as cough G1 from 6.6 to 10.5%, cough G2 from 6.0 to 6.6%, sputum G1 from 11.3 to 16.9%, sputum G2 from 7.2 to 9.1%, acute aggravation of cough and sputum from 8.9 to 15.7%, and continued cough and sputum syndrome from 3.8 to 5.3%. However, the frequency of respiratory symptoms of a higher order such as chronic bronchitis and chronic obstructive bronchitis showed no difference. No difference was found on lung function values. In short, probably because of the smaller increase of air pollution, no severe difference of respiratory symptoms was observed in these 5 years, however, the general increase of respiratory symptoms was still noticeable.

50994 **APTIC NO. 70325**

Joselow, Morris M., James E. Banta, Willa Fisher, and Jane Valentine

ENVIRONMENTAL CONTRASTS: BLOOD LEAD LEVELS OF CHILDREN IN HONOLULU AND NEWARK. *J. Environ. Health, 37(1):10-12, July/Aug. 1974. 8 refs.*

Blood lead levels from sample populations of children (similar age and sex distributions) living in Newark, New Jersey and Honolulu, Hawaii were measured and correlated with environmental contrasts between the two cities. Average lead levels (1969 data) for Newark and Honolulu were 1.7 micrograms/cu m and 1.2 micrograms/cu m, respectively. Housing in Newark was inferior to that of Honolulu with respect to age, condition, and the presence of lead-based paints. Most of the homes in Honolulu were built since 1950 and were probably lead-free for the most part. The mean blood-lead concentration of children living in Newark was 28 micrograms/100 ml blood (range 15-60 micrograms/100 ml) as compared to 17 micrograms/100 ml (range 10-30 micrograms/100 ml) for Hawaiian children. Blood lead levels of over 20 micrograms/100 ml were observed in 75% of the Newark children as compared to only 10% for the Hawaiian children. No children in the Hawaiian sample showed concentrations of blood lead greater than 40 micrograms/100 ml (presumptive level of excessive lead absorption), while at least 12% of the Newark children showed evidence of excessive lead intake. The blood level results confirm the environmental differences observed between the two cities with regard to air pollution, housing conditions, and socio-economic status of the populations.

50995 **APTIC NO. 68898**

Kimbrough, Renate D. and Ralph E. Linder

THE INDUCTION OF ADENOFIBROSIS AND HEPATOMAS OF THE LIVER IN MICE OF THE BALB/CJ STRAIN BY POLYCHLORINATED BIPHENYLS (AROCLOR 1254). *Preprint, Environmental Protection Agency, Chamblee, Ga., Chamblee Tmxicology Lab., 11p., 1974 (?). 8 refs.*

The induction of adenofibrosis and hepatomas of the liver in mice by polychlorinated biphenyls (Aroclor 1254) is described. Two groups of 50 BALB/cj inbred male mice were fed 300 ppm of the biphenyl in the diet for 11 and 6 month mo respectively. The 6 months feeding period was followed by a 5-months recovery period. Two additional groups of 50 mice each were fed plain chow. All 22 surviving mice fed Aroclor 1254 for 11 mo had greatly enlarged livers representing 25% of their body weight, while those fed the experimental diet for 6 mo had only slightly, but not significantly, enlarged livers. Adenofibrosis was observed in all 22 livers of mice fed Aroclor 1254 for 11 mo and not in the other groups. Of the 22 mice fed 300 ppm Aroclor 1254 for 11 mo, 9 mice had 19 hepatomas measuring from 0.1 to 1.5 cm in diameter. One of the 24 surviving mice fed the experimental diet for only 6 mo followed by a control diet for 5 mo, had a hepatoma measuring 0.3 cm in diameter. No hepatomas were found in the controls. (Author abstract modified)

50996 **APTIC NO. 70341**

Kimura, K.

AUTOMATIC ANALYSIS OF FLOW-VOLUME CURVE BY MINICOMPUTER. *(Konpyuta ni yoru jidokaiseki). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), 12(10):572, Oct. 1974.*

The problem of increasing respiratory diseases due to air pollution has intensified the requirements for respiratory function examinations. For resolving one of the requirements, the merits of introducing a computerized system on analysis of flow-volume curves were examined. The merits found were: a check of efforted expiration could be done objectively resulting in suppressing the fluctuation due to insufficient cooperation of the objects; there was no load on the examiner due to the calculation of data; the method was time-saving; and it was a sub-system which could be combined into a larger examination of respiratory function.

50997 **APTIC NO. 70363**

Kodama, Y., E. Kunitake, K. Nobutomo, T. Urabe, T. Inemasu, and N. Ishinishi

STUDIES ON ATMOSPHERIC CONCENTRATION OF LEAD AND LEAD CONTENT OF BLOOD. *(Taiki-chu namari nodo to kecchu namari ryo ni kansuru kenkyu). Text in Japanese. Sangyo Igaku (Jap. J. Ind. Health), vol. 16:138-139, 1974.*

A determination of the lead content of blood (micrograms/100 g) was carried out by the dithizone-double color method, and the atmospheric lead content was determined by collection with a high volume sampler and by the dithizone method. The values obtained were: in the order of place, occupation, number of subjects, lead in blood, arithmetic mean (micrograms/100 g), and atmospheric lead (micrograms/cu m): Fukuoka City, general inhabitants, 100, 11.78, and 0.1-5.7; a printing factory, workers, 19, 10.88, and 0-33.3; another printing factory, workers, 24, 12, 33, and 3.5-34.0; still another printing factory, workers, 112, 15.88, and 15.5-50.8; underground parking station, workers, 34, 15.39, and 0.8-1.7; Okinawa-Yaeyama Islands, general inhabitants, 56, 16.6, and 0.2-0.6.

50998 **APTIC NO. 70377**

Kodama, Y., K. Nobutani, Y. Fukushima, M. Iwasa, N. Ishinishi, and E. Kunitake

EPIDEMIOLOGICAL STUDIES ON THE ADJUSTED DEATH RATE OF LUNG CANCER AMONG RESIDENTS IN INDUSTRIAL AND COMMERCIAL CITIES. *(Kitakyushu- shi, Yahata-ku, oyobi Fukuoka-shi jumin no haigan shiboritsu ni kansuru ekigakuteki kenkyu (showa 39 - 44 nen). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):596, Nov. 1974.*

Based on the death notices in the Yawata Ward of Kitakyushu City and Fukuoka City, the sex, the age, smoking history, occupational history, and residence history of each death were investigated concerning the new international classification No. 162. On the other hand, the same investigation was carried out on the extracted samples of both cities population. Thus, the causes of death by lung cancer of the two cities were compared. In Yawata Ward, the death rate by lung cancer was greater in those having a history of air pollution exposure, and in males the mortality by lung cancer was significantly higher in those having a smoking history and a harmful occupational history. The epidemiological causes of lung cancer are smoking, harmful occupational history, and air pollution, in the above order.

50999 **APTIC NO. 70667**

Kyono, Hiroko, Katsunori Homma, Takashi Nagatani, Tadao Watanabe, and Kiyoyuki Kawai

LOCALIZATION OF INHALED LEAD PARTICLES IN THE RAT LUNG. *Ind. Health (Japan), 12(1-2):49-72, June 1974. 15 refs.*

The ultrastructural localization of inhaled submicron lead fumes was studied in rat lungs. The specimens were obtained from two series of experimental exposures to metallic lead fume, 0.3 micron in projected diameter at 120 mg/cu m concentrations in the first experiment, and 0.04 micron in projected diameter at 10 mg/cu m concentrations in the second experiment. Qualitative identification of lead in the fine particles deposited in the tissue was performed with the aid of an X-ray microanalyzer equipped with an energy dispersive type detector. Aside from the usual abundant accumulation of particles in the alveolar macrophages, widespread uptake of lead particles was a common finding in the epithelial cells covering the bronchial tree and the alveolar surface. In the bronchial epithelium, particles were found more frequently in the periphery, especially in the terminal region, in which nonciliated cells contained more numerous particles than ciliated epithelium. In the alveolar wall, both type I and type II alveolar epithelium contained lead particles. In every type of the above cells, phagosomes and lysosomes were the main site of localization of particles. Deformation and degradation of fume particles were conspicuous in the cytoplasm, especially in the lysosomes; their intercellular biological solubilization was suggested. The significance of the above findings is discussed in relation to possible mechanisms of the onset of cellular injury in the respiratory tract. (Author abstract modified)

51000 **APTIC NO. 73108**

Lafontaine, A.

THE ROLE OF LEAD AS AN ATMOSPHERIC POLLUTANT. *(Le role du plomb parmi les nuisances atmospheriques). Text in French. Rev. Epidemiol., Med. Soc., Sante Publique, 22(7):589-600, 1974. 29 refs. (Presented at the Symposium Ch. Gernez-Rieux: Nuisances Atmospheriques et Pathologie Respiratorie, Lille, France, June 23, 1973.)*

The significance of airborne lead to human health and its mode of entry into the organism is discussed. The amount of lead on submicron aerosols that can actually be absorbed by the pulmonary alveoli appears to be relatively small in comparison with the quantity ingested through food or water contaminated with lead fallout. Lead particles in the form of halogenated compounds do pose air pollution problems, although their significance in relation to other atmospheric pollutants needs to be evaluated. Additional research on the intake of airborne lead and its possible action on enzyme systems is required.

51001 **APTIC NO. 70373**

Lewis, Trent R., William J. Moorman, You-yen Yang, and Jerry F. Stara

LONG-TERM EXPOSURE TO AUTO EXHAUST AND OTHER POLLUTANT MIXTURES. *Arch. Environ. Health, 29(2):102-106, Aug. 1974. 16 refs.*

Beagles were exposed 16 hr daily for 61 months to raw and photochemically reacted auto exhaust, nitrogen oxides, and sulfur oxides, alone and in combination. Exposure to NOx reduced diffusion capacity and peak expiratory flow, while raw exhaust and raw exhaust combined with SOx produced pulmonary hyperinflation. Irradiated auto exhaust, along and in combination with SOx, produced increased expiratory resistance. Irradiated auto exhaust also impaired ventilatory distribution. Lung volumes, compliances, and maximum breathing capacity were not impaired by the experimental atmospheres. The results indicated that long-term, low-level exposure to ubiquitous urban air pollutants poses potential serious health hazards. (Author abstract modified)

51002 **APTIC NO. 71152**

MacEwen, J. D., E. R. Kinkead, and C. C. Haun

A STUDY OF THE BIOLOGICAL EFFECT OF CONTINUOUS INHALATION EXPOSURE OF 1,1,1,-TRICHLOROETHANE (METHYL CHLOROFORM) ON ANIMALS. *California Univ., Irvine, Toxic Hazards Research Unit, National Aeronautics and Space Administration NASA-CR- 134323, 57p., 1974.*

NTIS: N74-27550

Studies were conducted to evaluate the effects of continuous exposure to 1,1,1,-trichloroethane on hepatic morphology and function and to compare these effects with those produced by methylene chloride (dichloromethane) in a previous study. The primary aspect of comparison was to determine environmental concentrations of each compound that would produce a similar biological response, i.e., a comparable increase in liver triglycerides over control levels. a preliminary 14-day test was conducted using mice only to establish exposure concentrations for the 100-day continuous exposures. Concentrations of 250 and 1000 ppm of 1,1,1- trichloroethane (TCE) were selected as exposure concentrations for the 100-day continuous exposure study. Groups of 4 monkeys, 180 mice, 8 dogs, and 40 rats each were exposed to 250 ppm TCE, 1000 ppm TCE, and clean air. Ten mice were removed from each group on a weekly basis for gross examination. liver fat stains, and liver triglyceride determinations. Rats, dogs, and monkeys were weighed on a biweekly schedule for evaluation of growth patterns. The rats were sacrificed at the end of the expsoure period for organ weight measurement, liver fat stains, and complete histopathologic evaluation. Various blood tests were made on the dogs and monkeys. Continuous exposure of mice to 1000 ppm of TCE produced a significant increase in fat droplets; a slight increase was seen at 250 ppm. There was no evidence of hepatocyte necrosis, inflammation, or fibrosis in any of the mouse livers. In mice, almost all fatty change was micrroglobular and was in a centrilobular distribution; in monkeys, the majority of the fat was in Kupffer cells and only a trace of microglobular fat was present in hepatocytes of all groups, control and exposed. The 250 ppm exposure had little effect on liver weights and liver to body weight ratios, but an increase in liver to body weight ratios occurred with 1000 ppm TCE exposure of mice. The observed fatty liver change was a reversible effect.

51003 **APTIC NO. 70958**

Maruya, H., Y. Yamada, T. Eguchi, K. Nagayama, K. Shirakami, J. Ueda, N. Hanioka, and Y. Morita

RESULT OF HEALTH EXAMINATION OF SCHOOLCHILDREN: PART 3. COMPARISON OF CLAIMS OF SCHOOLCHILDREN BETWEEN MIZUSHIMA DISTRICT AND A TOWN IN THE NORTHERN PARTS OF OKAYAMA PREFECTURE. *(Kurashiki-shi gakudo no kenko chosa, dai 3po: Mizushima-chiku to kenpoku Ukan-machi gakudo no yuso no hikaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):310, Nov. 1974.*

An epidemiological survey by questionnaire and internal medical, ophthalmological, and otorhinological examination including chest roentgenography was carried out on 10,000 schoolchildren in the Mizushima district and compared to those in an unpolluted district in Okayama Prefecture. For all 43 subjective symptoms concerning respiratory functions the frequency of claims of those in the Mizushima district was larger than that of those in the unpolluted district; in many cases the frequency of claims being significantly higher. It has become more clear that air pollution is causing health impairment in younger children.

51004 **APTIC NO. 70569**

Mizutani, Nobuyoshi

A STUDY ON PROGNOSIS OF CHRONIC OBSTRUCTIVE LUNG DISEASE IN THE AIR-POLLUTED AREA - COURSE AND PROGNOSIS OF DESIGNATED PATIENTS IN THE YOKKAICHI AREA. *(Taiki osen chiku no mansei heisokusei hai shikkan no yogo - Yokkaichi chiku kogai nintei kanja no jittai). Text in Japanese. Nihon Kyobu Shikkan Gakkai Zasshi (Japan J. Thoracic Dis.), 12(8):437-446, Aug. 1974. 17 refs.*

A study was carried out to elucidate the clinical features and prognosis of the patients in Yokkaichi district who have been designated as patients officially because of air pollution; 39.6 % of them were younger than 9 and 36.3 % of them were older than 50. These cases were classified into four groups according to clinical diagnosis as: 36.8% bronchial asthma, 35.3% chronic bronchitis, 25.8% asthmatic bronchitis, and 2.1 % pulmonary emphysema. The percentage of cured patients was 20.9% until 1969, and that of patients younger than 9 was 45.3%. The number of deaths was 75 cases until 1972, 80% of the death occurring in patients older than 60. The percentages of the causes of death were 37.3% respiratory diseases, 10.7% heart diseases, 26.7% malignant tumors, and 25.3% others. Malignant tumors included seven cases of lung cancer, five cases of which showed abnormal shadows at their first visit to apply for the designation. Observed deaths divided by expected deaths gave 1.48 in males and 1.88 in females. The clinical features of death cases of bronchial asthma were older persons, higher age of onset, shorter duration of symptoms, more frequent episodes of pneumonia in past history, and lower FEV 1.0%. In the cases of chronic bronchitis and pulmonary emphysema deaths, the characteristics of the clinical findings were a larger amount of sputum and lower vital capacity and forced expiratory volume than those of surviving cases.

51005 **APTIC NO. 70766**

Okutani, Hirotoshi, Akira Harada, and Hideo Kurita

THE EFFECTS OF LEAD ON PUPILS OF GRADE AND JUNIOR HIGH SCHOOLS IN THE MOUNTAINS. *(Sankan hichi ni okeru sho-chugakusei no en osen). Text in Japanese. Preprint, Japanese Society of Public Health, Tokyo, p. 365, 1974. (Presented at the Japanese Society of Public Health, Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 479.)*

Thirty children (10 lower and 10 higher grade school students and 10 junior high school students) in the Hiratani township of the Nagano prefecture were examined for blood level urinary lead urinary, coporphyrin urinary alanine, BPC, RC, hemoglobin, and hematocrit levels. The average blood lead level was 6.1 micrograms/dl, and the average urinary Pb 6.5 micrograms/l; average urinary coporphyrin 18.1 micrograms/l and average urinary alanine 1.23 mg/l. The girl students had lower values for each item than the boys. Blood Pb and urinary alanine levels decreased and urinary lead and coporphyrin levels increased with increasing age. Lead levels were generally lower as compared to the students in cities.

51006 **APTIC NO. 70803**

Omichi, S. and H. Kita

EFFECTS OF AIR POLLUTANTS ON THE MOVEMENT OF CILIA IN AIRWAYS. PART II. *(Kido senmo undo ni oyobosu taiki osen busshitsu no eikyo (II)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):333, Nov. 1974.*

The movement of cilia on ciliated epithelium taken from the trachea of sacrificed guinea pig was observed by oscilloscope with a recorder via phase-contrast microscope under the influence of various concentrations of sulfur dioxide, nitrogen dioxide, nitric oxide, ozone, and formaldehyde, respectively. The movement of cilia (beat/min) observed under ordinary atmosphere was 220 at 8 C, 810 at 39 C and then decreased with thee increase of temperature, stopping at 45 C, and it was reversible in the range from 8 to 35 C. It was 675 + or - 13 just after preparation and 677 + or - 100 after 150 min of preparation of the specimen. The half life of cilial function (time lapsed after which the beat decreased to 50%) at 50 ppm of gases was 4, 5, 10, 14 and 20 min, respectively by SO2, formaldehyde, NO2, NO and ozone.

51007 **APTIC NO. 70690**

Pankow D. and W. Ponsold

SYNERGISTIC EFFECT OF CARBON MONOXIDE WITH OTHER BIOLOGICALLY ACTIVE INJURIOUS FACTORS ON THE ORGANISM. *(Kombinationswirkungen von Kohlenmonoxid mit anderen biologisch aktiven Schadfaktoren auf den Organismus). Text in German. Z. ges. Hyg. ihre Grenzgebiete (Berlin), 20(9):561-571, Sept. 1974. 138 refs.*

The combined effects on biological organisms are reported for carbon monoxide and carbon dioxide, nitrogen oxides, sodium nitrite, hydrocyanic acid, carbon disulfide, sulfur dioxide, ammonia, hydrogen peroxide, ethanol, trichloroethylene, carbon tetrachloride, methane, benzene, iodine acetate, cholesterol, benzpyrene, hexobarbitol, zoxazolamine, nembutal, luminal, morphine, adrenalin, persantin, cytochrome c, aldrin, carbaryl, cyclodiene epoxide, and physical influences such as ambient temperature, atmospheric pressure, ionizing radiation, noise, and vibration. A literature review shows that with increasing CO2 and decreasing oxygen concentration in the inhalation air, the toxicity of CO increased in experiments with mice and canaries. Oxides of nitrogen enhance the toxic effect of CO in an additive way and at times synergistically. At 500 m from a metallurgical plant in the USSR the maximum allowable immission concentrations for CO (3 mg/cu m) and SO2 (0.5 mg/cu m) were exceeded. In children residing there a higher normal erythrocyte number, hemoglobin content, and catalase activity were found in the blood along with higher concentrations of coproporphyrin and 17-ketosteroids. All values returned to normal after an 8-week stay of these children away from the metallurgical plant.

51008 **APTIC NO. 70621**

Plamenac, Pavle, Ivana Tomic, Branko Pikula, Mirza Kahvic, Zdravko Markovic, Ivica Selak, and Zrinka Zeger-Vidovic

PLEURAL PLAQUES AND SPLENIC CAPSULAR SCLEROSIS IN URBAN AND RURAL SERIES OF AUTOPSY CASES. *Acta Med. Iugoslavica, 28(3):201-217, 1974. 85 refs.*

Pleural plaques and splenic capsular sclerosis were evaluated in 452 adult autopsy cases in rural and urban areas. Pleural plaques were found in 12.5% of male residents from Sarajevo (urban group) and in 3.1% of the females. Asbestos is a major source of the pollution in Sarajevo. The same lesions were present in 5.3% of the male residents from the surrounding air pollution- free zones (rural group). No female in this region had pleural plaques. Splenic capsular sclerosis was discovered in 14.4% of the male residents in Sarajevo and in 10.4% of the females. This lesion was noted in 6.5% of the rural group of the males and in 4.1% of the females. Both kinds of changes were separate entities, and there was no correlation between them. (Author abstract modified)

51009 **APTIC NO. 70782**

Sato, S., C. Miyahara, Y. Horiguchi, Y. Wada, T. Takahashi, T. Shimada, K. Fukaya, S. Fukui, and S. Sugano

STUDIES ON THE INFLUENCE OF PHOTOCHEMICALLY PRODUCED SUBSTANCES ON LIVING BODY: PART I. ON ACROLEIN. *(Kokagaku kogai genin busshitsu no seitai ni oyobosu eikyo ni kansuru kenkyu (dai ippo) akurorein ni tsuite). Text in Japanese. Kanagawa-ken Koshu Eisei Gakkai-shi (Bull. Kanagawa Prefect. Pub. Health Assoc.), no. 20:4-5, July 1974.*

Based on the reported existence of acrolein in photochemical smogs, several examinations were carried out on the action of acrolein on dogs and rabbits with exposure by inhalation of acrolein at 0-300 ppm under narcosis with panthobarbital or another drug. Acrolein acted repressively on the circulatory system, however, only at a much higher concentration which would not be experienced in the environment; the symptoms were depression of blood pressure of 10% with arrhythmia accompanying abnormal ECG; acrolein gave a change of respiratory movement, however, it was very light at less than 5 ppm; and eyelid movement was accentuated only at more than 100 ppm of acrolein. Further, the results of continued exposure of unanesthetized rabbits, 2 hr/day for 20 days to 5 ppm of acrolein were almost the same as the above results. Thus acrolein is not itself a causal substance of photochemical damage.

51010 **APTIC NO. 70359**

Schmidt, F.

TOBACCO SMOKE AS THE MOST IMPORTANT AIR POLLUTANT INDOORS AND PATHOGENIC NOXA FOR PASSIVE SMOKERS. *(Tabakrauch als wichtigste Luftverschmutzung in Innenraeumen und als pathogene Noxe fuer Passivraucher). Text in German. Med. Welt (Stuttgart), 24(44):1824-1832, 1974. 106 refs.*

The effects of passive smoking on man as reported in literature are reviewed. More than 1150 different chemical substances have been found in tobacco smoke; more than 20 have been to date identified as carcinogens. The secondary smoke is at least three times as rich in carcinogenic benzpyrene and 4.6 times as rich in toxic carbon monoxide as the main smoke which is inhaled by the smoker. Furthermore, secondary smoke contains the major quantity of nicotine. The acute symptoms from passive smoking are eye irritation (in 69% of the cases), headache (31%), cough, nausea, dizziness, sore throat, and hoarse voice. Passive smokers have a clearly higher blood pressure, pulse rate, and CO content in the blood after only 30 minutes in a room polluted with tobacco smoke. Apart from CO, oxides of nitrogen are present in high concentration in cigarette smoke.

51011 **APTIC NO. 70583**

Secchi, Gian Carlo and Lorenzo Alessio

LABORATORY RESULTS OF SOME BIOLOGICAL MEASURES IN WORKERS EXPOSED TO LEAD. *Arch. Environ. Health, 29(6):351-354, Dec. 1974. 20 refs.*

Erythrocyte ALA-dehydratase activity and blood lead levels were studied in different groups of subjects not occupationally exposed to lead (male and female clerical workers, traffic policemen, motorway tollgate attendants, and chronic alcoholics consuming over 2.5 l/day of wine) and compared to levels in 710 workers occupationally exposed to lead. Blood lead levels among the nonoccupationally-exposed groups ranged from a low of 24.0 micrograms/100 ml blood for female clerical workers to a high of 49.9 micrograms/100 ml blood for chronic alcoholics. The ALAD activities for these two groups were respectively 22.3 and 4.58 milliunits/ml in red blood cells. Traffic policemen and tollgate attendants showed ALAD levels of 15.4 and 11.5 milliunits/ml, respectively, and blood lead levels of 36.0 and 45.8 micrograms/100 ml blood, respectively. Blood lead levels for occupationally-exposed workers ranged from 52.7-77.7 micrograms/100 ml blood for individuals recently exposed versus those clinically intoxicated; the ALAD activities for these two groups were 8.7 and 1.6 milliunits/ml, respectively. Erythrocyte ALAD activity depression appears to be primarily useful in evaluating possible exposure to minimal quantities of lead rather than for medical surveillance of occupatonally exposed persons.

51012 **APTIC NO. 70740**

Shishido, M., K. Sugita, F. Higuchi, and A. Ogihara

RESULT OF RESPIRATORY FUNCTION EXAMINATION OF POLICEMEN BY FLOW-VOLUME CURVES. *(Keisatsu-kan no flow-volume kyokusen ni yoru kokyu kino-chi). Text in Japanese. Nippon Koshu Eisei (Japan. J. Public Health), 21(10):423, Oct. 1974. (Presented at the Japanese Society of Public Health, Annual Meeting, 33rd, Fukushima, Japan, Oct. 16-18, 1974, Paper 553.)*

Flow-volume curves were obtained for 745 policemen engaging patrol car and autobicycle duties. From these curves, the maximal expiration velocity at 50% and 25% vital capacity (V50 and V25), % vital capacity (% VC), and 1-second forced expiratory volume (FEV 1.0%) were calculated. These values were classified by age, smoking kinds of cars, and duration of riding, then the respective averages and standard deviations were obtained for comparison. The V50, and FEV 1.0% decreased with age, V25 especially showed a marked decrease. The V50, V25 and FEV 1.0% of smokers of over 21 cigarettes were markedly lower than those before smoking. In general, these values were lower as the duration of riding was longer and were higher in policemen of patrol cars than policemen of autobicycles.

51013 **APTIC NO. 70779**

Shishido, M., K. Sugita, F. Higuchi, A. Koshirohara, M. Hino, and G. Komatsu

SURVEY OF RESPIRATORY FUNCTION: RESULTS OF EXAMINATION OF INHABITANTS IN AIR POLLUTED AREA. *(Flow-Volume kyokusen ni yoru kokyu kino chosa taiki osen chiiki no jumin kenshin seiseki). Text in Japanese. Kanagawa-ken Koshu Eisei Gakkai-shi (Bull. Kanagawa Prefect. Pub. Health Assoc.), no. 20:7, July 1974.*

On the assumption that air pollution gives bad effects to both the respiratory system and to the circulatory system, 273 inhabitants of the Koyasu area in Yokohama City were examined from various sides, the age of the subjects being older than 35. The results of examination were: 63% of the people who have symptoms on the respiratory system showed abnormal percentage vital capacity, 37% of them showed decrease of the V75 value, 21% of them had symptoms of chronic bronchitis, and 16% of them showed abnormal values of V50/V25 and of V50; 53% of the people who showed a decreased 1-second rate consisted of those who showed a decrease of percentage vital capacity and of those whom the V75 value decreased; 23% of those who showed decreased percentage vital capacity were those who showed decreased V50 and V75; 77% of those who showed decreased V50 were those who showed percentage decreased vital capacity; and more than 75% of the inhabitants who showed any abnormal value on respiratory function had a living history in the area of more than 25 years. Twenty-five percent of lowered vital capacity, 8% of decreased V50 value, 7% of respiratory symptom, and 6% of the decreased 1-second rate cases were detected in the present survey.

51014 **APTIC NO. 70780**

Shishido, M., K. Sugita, F. Higuchi, A. Koshirohara, K. Abe, M. Oda, and K. Komuro

STUDIES ON THE RESPIRATORY FUNCTION BY FLOW-VOLUME CURVES: PART I. COMPARISON OF RESPIRATORY FUNCTION OF THE INHABITANTS IN KANAGAWA WARD AND IN ISOGO WARD, YOKOHAMA CITY. *(Flow-volume kyokusen ni yoru kokyu kino no kenkyu, dai ippo: Yokohama-shi Kanagawa-ku to Isogo-ku no jumin no kokyukino no hikaku). Text in Japanese. Kanagawa-ken Koshu Eisei Gakkai-shi (Bull. Kanagawa Prefect. Pub. Health Assoc.), no. 20:6, July 1974.*

Respiratory functions were determined on 253 inhabitants of both sexes in Kanagawa Ward (Koyasu) and on 369 inhabitants of both sexes in Isogo Ward, both in Yokohama City, in Feb. 1974. In males, the values of V75, V25, V10, and the maximum expiration velocity of peak flow rate, and those values per body height, body weight, and surface area were significantly higher in Isogo than in Koyasu except for V75/BSA. The values of percent vital capacity and forced expiratory volume 1.0% were also signficantly higher in Isogo. In females, the values of maximum exiration velocity were significantly higher in Isogo except for V75/BSA and V50, and especially, the values of V25 and V10, and those values per height, weight and surface area were higher in Isogo with higher significant level. In both sexes, V75/V25 and V50/V25 were significantly higher in Koyasu, and the percentage vital capacity was significantly lower in Koyasu than in Isogo in every age and total ages. The amount of air pollutant was lower in Isogo than in Koyasu shown in 0.4-0.5 mg versus 0.5-0.8 mg sulfur trioxide. No large difference of dust fall between the two Wards was noted.

51015 **APTIC NO. 70783**

Shishido, M., K. Sugita, F. Higuchi, and A. Koshirohara

INFLUENCE OF PHOTOCHEMICAL SMOG ON THE RESPIRATORY FUNCTION: OBSERVATION BY FLOW-VOLUME CURVES. *(Kokagaku sumoggu no kokyu kino ni oyobosu eikyo - flow-volume curve ni yoru kansatsu). Text in Japanese. Kanagawa-ken Koshu Eisei Gakkai-shi (Bull. Kanagawa Prefect. Pub. Health Assoc.), no. 20:5-6, July 1974.*

On the occasion of photochemical smog on July 10, 1974 with an oxidant concentration of 0.15 ppm maximum and sulfur dioxide concentration of 0.1 ppm in Asahi Ward, Yokohama City, the flow-volume curves at 24 middle schoolchildren were determined during an examination of urinoprotein, urinosugar, urobilinogen, and pH of urine. These data were compared to those obtained in other days, May 16, 30, June 13, and 25. It was found that although no abnormality was detected in urinalysis and on the whole the decrease of respiratory function was not confirmed on the photochemical smog day, personally in 10 children of 24 subjects a slight disturbance due to airway obstruction was recognized on their flow-volume curves. It is not certain whether the airway obstructive disturbance is transient or irreversible.

51016 **APTIC NO. 70590**

Sidorenko, G. I. and M. A. Pinigin

PROBLEMS OF COMPLEX NORMATIVES IN HYGIENE CONCERNING THE PERMISSIBLE PROPORTIONS OF CHEMICAL SUBSTANCES IN THE ENVIRONMENT. *(Zum Problem der komplexen Hygiene-Normative fuer den zulaessigen Gehalt an chemischen Stoffen in der Umwelt). Text in German. Z. ges. Hyg. Ihre Grenzgebiete (Berlin), 20(11):758- 760, 1974.*

Using benzene as a model, an experimental method for evaluating the complex effects of environmentally toxic substances is developed. For determination of isoeffective concentrations in air and in water the dependence concentration/time was studied with regard to certain threshold effects following separate aerogenic and peroral exposure of the test animal to the pollutant. For successful application of this method, at least three to four concentrations must be studied in each case. For high concentrations, exposure can be limited to 1 wk; for medium concentrations 2-3 wk; and for low concentrations 2-3 mo. The results are plotted as concentration/time curves. Analysis of the results of the study of the complex effect of benzene on the basis of the chronaxy of antagonistic muscles in rats showed that the combined concentration, expressed in percent of the magnitude of the isoeffective concentrations at isolated exposure, rises with decreasing exposure from 71.5 to 93.5%. At high concentrations an involution effect can be observed which changes to a summation effect at low concentrations.

51017 **APTIC NO. 68715**

Sorenson, John R. J., Irene R. Campbell, Lloyd B. Tepper, and Robert D. Lingg

ALUMINUM IN THE ENVIRONMENT AND HUMAN HEALTH. *Environ. Health Perspect., vol. 8:3-95, Aug. 1974. 818 refs.*

A review of over 800 references on aluminum published since the mid-fifties covers the occurrence of Al in soil, air, water, plants, food products, and humans. The biology and toxicology of Al and its therapeutic and medical uses are also presented. Absorption and retention of Al in humans occurs at lower levels of intake than formerly assumed, and levels of 5-50 times the normal daily intake do not appear to interfere with other metabolic processes. The adverse effects of Al reported in recent years result from inhalation or ingestion of Al in concentrations many times greater than the amounts present under normal circumstances. There is no need for concern about the human health hazards of the metal as contained in well established and extensively used products. (Author abstract modified)

51018 **APTIC NO. 70666**

Suzuki, Shosuke and Tsuguyoshi Suzuki

INTERRELATIONSHIPS OF SOME BIOCHEMICAL INDICATORS OF LEAD ABSORPTION WITH SPECIAL REFERENCE TO SERUM DELTA-AMINOLEVULINIC ACID AND ITS RENAL CLEARANCE. *Ind. Health (Japan), 12(1-2): 37-48, June 1974. 45 refs.*

Some biological indicators of lead absorption from 23 lead smelters were examined three times. During an accidental month s discontinuation of exposure, the mean concentrations of coproporphyrin and delta-aminolevulinic acid in urine decreased to 1/3 and the positive rates of subjective complaints decreased to 1/2. The hemoglobin content, stippled cells, polychromatic cells, reticulocytes, and lead concentrations showed much less improvement, however. Factor analysis of the indicators revealed the concentration of coproporphyrin in urine had a very different character. Ninety-three percent of the data matrix of the indicators were explained by four factors. The mean concentration of delta-aminolevulinic acid in serum was 35.5 + or 11.4 micrograms/dl; the renal clearance and renal reabsorption rates of the substance were 11.2-16.9 ml/min and 92.5-97.5%, respectively, in the six smelter workers admitted for 6 days to a hospital, except for one case. Delta-aminolevulinic acid in serum will never be an excellent indicator of lead absorption, but it may be a key substance when coupled with the delta-aminolevulinic acid and coproporphyrin excretions in the urine. (Author abstract modified)

51019 **APTIC NO. 70734**

Takishima, T.

THE PROBLEMS OF RESPIRATORY FUNCTION (9)-EVALUATION OF AIR POLLUTION AND DISTURBANCE OF RESPIRATORY FUNCTION - A REMARK OF THE CHAIRMAN OF THE SYMPOSIUM WITH THE ABOVE TITLE. *(Kokyu kino no mondaiten (9) - Taiki osen to kokyu kino shogai no hyoka Shikai no kotoba). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), 12(10):555, Oct. 1974.*

There is a paradox between the necessity to establish the method of detecting disturbances of respiratory function and the necessity of elucidating the disturbances of respiratory systems damaged by air pollution. Of the possible and actual methods for examining disturbances of respiratory function such as spirography, 1-second rate, vital capacity, respiratory resistance by the oscillation method, respiratory resistance by body plethysmography, flow-volume curve, phenomenon of closing volume, the frequency-dependency of dynamic lung compliance, the frequency-dependency of intrapulmonary distribution of gases, gas-diffusion in the gaseous phase, and gases in blood four methods were adopted in the present symposium. The methods of approach to disturbances of respiratory function concerning air pollution are biological models formed by air pollutants, smoker model for simulating air pollution, and living body model selected from iahabitants in polluted district. The utility of these methods is described.

51020 **APTIC NO. 70662**

Thieme, R., P. Schramel, B. J. Klose, and E. Waidl

THE INFLUENCE OF ENVIRONMENTAL FACTORS UPON TRACER ELEMENTS OF THE PLACENTA. *(Der Einfluss regionaler Umweltfaktoren auf die Spurenelement-Zusammensetzung der Plazenta). Text in German. Geburtsh. Frauenheilk. 34(1):36-41, Jan. 1974. 9 refs.*

The content of several heavy metals in placental tissue collected at different Bavarian areas by atomic absorption spectrometry was examined. The concentrations of elements like lead, cadmium, and chromium in placental tissue showed a statistically significant increase at Altoetting, Munich, and Bayerischer Wald, where the tissues were evaluated. A somewhat higher concentration of lead occurred in the placental tissue at Bayerischer Wald, apparently due to the intake of water and food containing heavy metals; in the area around Munich, incorporation of heavy metals into the placenta was predominantly due to the inhalation of exhaust gases. The similar significantly higher content of copper in placental tissue at Bayerischer Wald apparently was caused by a compensation of the organism, and therefore elements like manganese, aluminum, and iron did not show any difference.

51021 **APTIC NO. 70390**

Uschewa, G. and S. Pavlova

ON THE CERULOPLASMA CONTENT IN THE BLOOD AT LOW DEGREE EXPOSURE TO CARBON DISULFIDE. *(Ueber den Gehalt von Caeruloplasmin im Blut bei niedriger Schwefelkohlenstoffexposition). Text in German. Z. ges. Hyg. Ihre Grenzgebiete (Berlin), 20(11):753-754, 1974. 12 refs.*

An investigation of 16 workers exposed to low concentrations (below the maximum allowable workplace concentrations) of carbon disulfide revealed that serum ceruloplasmin activity was inhibited. Copper content in the blood and urine was normal. This response to CS2 can be used as an extremely sensitive method of detecting CS2 exposure.

51022 **APTIC NO. 70739**

Yamauchi, T. and Y. Tsuji

STUDIES OF LUNG FUNCTION BY FLOW-VOLUME CURVE, ON THE LUNG FUNCTION OF SCHOOLCHILDREN IN EASTERN PART OF KORIYAMA CITY. *(Flow Volume Curve ni yoru hai kino no kenkyu - Koriyama-shi tobu chiku no gakudo no hai kino ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 21(10):424, Oct. 1974.*

In order to know the effects of air pollution on the lung function of primary and middle schoolchildren, especially on the frequency of light obstructive disturbances, an examination was carried out in the eastern industrial part of Koriyama City in 1974. Lung function was examined by flow-volume curve recorder. Subjective symptoms were also determined. The sulfur dioxide concentration in the air was a little more than 0.01 ppm, and dust fall was 4-6 t/sq km/mo. From their flow-volume curves, V50, V25, and V10 were derived and divided by body height (V50/Ht, V25/Ht, V10/Ht). The TC-50 and TC-25 were designated respectively as V50/50% value of forced and vital capacity (FVC), V25/25% value of FVC. The average V50/Ht, V25/Ht and V10/Ht were higher in older children and lower in children from polluted areas. There was no difference of V50/V25 between children in polluted and nonpolluted areas. The TC-50 and TC-25 were higher in polluted areas than in nonpolluted areas, however, not significantly. The results of the examination on lung function showed no significant differences in children of air polluted and of nonpolluted areas.

51023 **APTIC NO. 70352**

Kyoto Municipal Inst. of Public Health (Japan), Div. of Epidemiological Studies

EPIDEMIOLOGICAL STUDY ON THE HUMAN EFFECTS OF TRAFFIC NUISANCE. *(Kotsukogai no jintaieikyo ni kansuru ekigakuteki kenkyu). Text in Japanese. Kyoto-shi Eisei Kenkyusho Eiken Nenpo (Annu. Rept. Kyoto City Inst. Public Health), no.40 (1973):138, Oct. 1974.*

A health survey was conducted on the inhabitants living along the roads with heavy motor traffic in Kyoto city. The subjects were 4956 housewives living along the main 28 roads and 1073 housewives living remote from the main roads. The survey utilized the questionnaires concerning symptoms of the respiratory system, symptoms of carbon monoxide intoxication, general health state, and symptoms of neurosis; the questionnaire consisting of 111 items. The results will be published after the completion of an environmental pollution survey which is now under way.

51024 **APTIC NO. 70716**

Osaka Prefectural Health Administration (Japan), Div. of Environmental Health

RESULT OF TRACING SURVEY OF THE INJURED PUPILS POSSIBLY ATTACKED BY THE PHOTOCHEMICAL SMOG OCCURRING IN TAKAISHI CITY. *(Taikaishi- shi ni oite hasseishita kokagaku sumogu ni yoru to omowareru higaino atta seito no tsuisekichosa). Text in Japanese. In: Kokagaku Sumogu ni Kansuru Chosakenkyu No. 1 Osaka-fu, 1974. p. 283-291, Feb. 1974.*

The results of a survey on hospitalized pupils (10 on Aug. 27 and two on Sept. 2, 1971) who complained of disturbance of consciousness, pain in the chest, dyspnea, pain in the pharynx, hoarse voice, and cough, are presented. The examination 10-13 days after their discharge showed a disappearance of subjective symptoms at hospitalization and restored white blood cells, except in one case in which the patient suffered from angina on the day of examination. Some cases showed higher alkaline phosphatase activity; the second examination after 60 days of the discharge showed complete disappearance of subjective symptoms and a normal range of alkaline phosphatase activity. These results were diagnosed as the complete restoration to a normal state.

51025 **APTIC NO. 70717**

Osaka Prefectural Health Administration (Japan), Div. of Environmental Health

THE RESULTS OF SURVEY ON THE MIDDLE SCHOOL PUPILS WHO SHOWED SYMPTOMS SEEMINGLY DUE TO PHOTOCHEMICAL SMOG. *(Kokagaku smogu ni yoru to omowareru shojo, ni atta Moriguchi dai 4 chugakusei no chosa, showa 48 nendo). Text in Japanese. In: Kokagaku Sumogu ni Kansuru Chosakenkyu No. 1 Osaka-fu, 1974. p. 283-291, Feb. 1974.*

A survey was carried out on Dec. 6 and 14, 1972 on the 18 patients hospitalized with symptoms seemingly due to photochemical smog on Oct. 3, 1972. The white blood cells of the patients or their neutrocytes increased on seven patients out of eight at hospitalization; however, at the second examination after 1 day, they were restored to normal value. The EEG on 39 pupils out of 43 injured pupils showed abnormal findings on one hospitalized patient and on two pupils out of 25 nonhospitalized pupils. Only one case also showed clinical abnormality, and that case is now being treated. According to the EEG on 268 pupils notwithstanding photochemical smog, 89 cases showed characteristic findings, and of them, 19 cases showed an abnormality with a pathological history. Of 275 pupils, 86 cases complained of eye and throat irritation and 55 cases showed a positive disturbance of orthostatic control. The disturbance was stronger in pupils with more severe symptoms, suggesting that there were some pollutants which induced the especially severe symptoms.

51026 **APTIC NO. 70719**

Osaka Prefectural Inst. of Public Health (Japan), Microorganism Div.

EFFECT OF OZONE-EXPOSURE ON THE MECHANISM OF PROTECTION TO INFECTION. *(Kansebogyo-kiko ni taisuru ozon bakuro no eikyo showa 47 nendo). Text in Japanese. In: Kokagaku Sumogu ni Kansuru Chosakenkyu No. 1 Osaka-fu, 1974. p. 309-315, Feb. 1974.*

A rabbit with a body weight of about 2.5 kg was exposed to 5 ppm ozone for 3 hr. The interferon producibility of alveolar macrophages collected just after the ozone exposure showed no difference compared to those of an unexposed rabbit. Also no difference was observed on the cell-coagulation tendency and the cell movement of the macrophages between those from the exposed rabbit and the unexposed rabbit. Strainated cells of L and RK-13 were exposed to 4 ppm ozone for 5 min. The interferon producibility of the exposed cells was less than that of unexposed cells, and the cell-division of exposed RK-13 cells was delayed compared to unexposed RK-13 cells. The interferon producibility of palatal tonsilar lymphocytes of a rabbit exposed to 5 ppm ozone for 3 hr decreased as compared to that of the unexposed rabbit.

51027 **APTIC NO. 70720**

Osaka Prefectural Inst. of Public Health (Japan), Lab. of Public Health

EFFECT OF OZONE-EXPOSURE ON THE INFECTION OF INFLUENZA VIRUSES ON MICE. *(Infuruenza birusukansen ni taisuru ozon bakuro no eikyo showa 47 nendo). Text in Japanese. In: Kokagaku Sumogo ni Kansuru Chosakenkyu No. 1 Osaka-fu, 1974. p. 315-318, Feb. 1974.*

After 1 day of exposure of 4 week old mice to ozone at 3 ppm for 2 hr, two varieties of influenza virus, A/Okuda/57 and A/FMI/47, were introduced, and the survival percentage of inoculated mice was observed after 2 weeks. The secreted substances were collected from the exposed and the unexposed mice, and the components were determined by disc-electrophoresis and immuno- electrophoresis. The lung washings of ozone-exposed mice contained serum protein components. The proliferation of a weakly pathogenic virus, A/Okuda/57 in the lungs of ozone-exposed mice was the same as that in the lungs of nonexposed mice. No difference of mortality was observed by the strongly pathogenic virus, A/FMI/47, between ozone-exposed mouse and nonexposed mice. A fluctuation of cross immunity between weakly and strongly pathogenic viruses was observed.

51028 **APTIC NO. 70721**

Osaka Prefectural Inst. of Public Health (Japan), Lab. of Environmental Health

THE EFFECT OF ACUTE EXPOSURE OF MICE TO OZONE AND PHOTOCHEMICAL OXIDANT ON THEIR LEUKOCYTES. *(Ozon oyobi kokagaku okishidanto kyusei bakuro no mausukkekyu no oyobosu eikyo). Text in Japanese. In: Kokagaku Sumogu ni Kansuru Chosakenkyu No. 1 Osaka-fu, 1974. p. 319-323, Feb. 1974.*

Two main groups of JCR-ICR female mice were exposed to ozone at 1, 2, 3, and 5 ppm for 3 hr, one main group being kept free and the other main group being kept in cages with an activity wheel. Another two groups of the mice were exposed to artificially prepared photochemical oxidants at an average of 0.3-0.6 ppm for 3 hr. Just after and 3-5 hr after the exposure their blood was collected and WBC (white blood cells) were examined. The WBC of mice exposed to ozone significantly increased at 3 ppm, and there were a few instances of not increasing at 1 and 2 ppm. The index of WBC was increased at 3 and 5 ppm. Total concentration of hemoglobin significantly increased at 5 ppm. The WBC of the mice exposed [illegible] the oxidant showed some instances of increase. The harmful action of oxidants by inducing WBC increases was thought to be greater than ozone at the same concentration, suggesting the existence of something in the oxidant which causes the WBC increase. The mice activity (rotation of the activity wheel) caused the conspicuous decrease of WBC.

51029 **APTIC NO. 70722**

Osaka Prefectural Inst. of Public Health (Japan), Microbiology Lab.

THE EFFECT OF OZONE-EXPOSURE TO THE SYSTEM OF PROTECTION AGAINST INFECTION. *(Kansenbogyo-kiko ni taisuru ozon bakuro no eikyo showa 48 nendo). Text in Japanese. In: Kokagaku Sumogu ni Kansuru Chosakenkyu No. 1 Osaka-fu, 1974. p. 324-325, Feb. 1974.*

The interferon producibility of alveolar macrophages of rabbits exposed to ozone at 5 ppm for 3 hr was almost completely inhibited for 48 hr of observation. The bacteriophagal activity of the macrophages to 3H-thymidine-labelled Escherichia coli was also inhibited just after and 24 hr after the exposure. The movement of the macrophages was also conspicuously inhibited; however, it was restored after 24 hr. Even at 1 ppm for 3 hr the interferon producibility showed a decrease. The synthetic ability of the macrophages was inhibited markedly. The lymphocyte of the tonsils of the rabbits exposed to ozone at 5 ppm for 3 hr, and the lymphocyte of the removed human tonsil exposed to ozone at 5 ppm for 5 min showed a decrease of interferon producibility with remarkable inhibition of nucleic acid synthesis induced by phytohemagglutinin.

51030 **APTIC NO. 70723**

Osaka Prefectural Inst. of Public Health (Japan), Microbiology Lab.

THE EFFECT OF OZONE-EXPOSURE TO THE INFECTION OF INFLUENZA VIRUSES. *(Infuruenza birusu kansensho ni taisuru ozon bakuro no eikyo). Text in Japanese. In: Kokagaku Sumogu ni Kansuru Chosakenkyu No. 1 Osaka-fu, 1974. p. 327-328, Feb. 1974.*

After 2-5 hr of influenza virus exposure, the secreted antibody from mice airways lost immunoactivity to about 1/3 of the virus if the mice were previously immunized via 1 ppm ozone exposure for 1 hr. Mice were inoculated to the virus after 1 ppm ozone exposure for 1 hr, and information was obtained suggesting weakening of the suppression of virus proliferation.

51031 **APTIC NO. 70724**

Osaka Prefectural Administration of Health (Japan), Div. of Environmental Health

A SURVEY OF PHOTOCHEMICAL SMOG PATIENTS AFTER ONE YEAR OF THEIR DISCHARGE FROM THE HOSPITAL. *(Taiingo 1 nenme no chosa). Text in Japanese. Kokagaku Sumogu ni Kansuru Chosakenkyu No. 1 Osaka-fu, 1974. p. 344-349, Feb. 1974.*

Ten pupils hospitalized after a photochemical smog episode on Aug. 27, 1971 were surveyed. Main symptoms during hospitalization were chest pain, eye irritation, throat pain, dyspnea, and disturbances of consciousness. White blood cells also increased. During examinations 10-13 days, 70 days, and 1 year after the episode, no symptoms were found.

51032 **APTIC NO. 73129**

Medical College of Wisconsin, Milwaukee, Dept. of Environmental Medicine

SUMMARY OF RESULTS OF RESEARCH DIRECTED TOWARD ELICITING EFFECTS OF EXPOSURE TO CARBON MONOXIDE ON THE SPONTANEOUS ELECTROENCEPHALOGRAM AND VISUAL EVOKED CORTICAL ELECTRICAL ACTIVITY. *Coordinating Research Council and Environmental Protection Agency Contract CRC-APRAC, Proj. CAPM-3-68, Rept. CRC Air Pollution Research Advisory Committee CAPM-3-68 MCOW-ENVM-CO- 74-3, 34p., 1974 (?). 12 refs.*

The effect of carbon monoxide exposure on the spontaneous electroencephalograms and visual evoked cortical electrical activities of young adult males was studied. The EEG was generally resistant to change during 8-hour exposures to 50, 100, 200, and 500 ppm CO and during 24-hour exposures at lower CO levels (10% carboxyhemoglobin saturation). Exposure to high CO levels for short periods (COHb greater than 20% for less than 8 hr) or to low levels for longer periods (COHb less than 10% for 24 hr) resulted in increases in VER wave amplitude that were indicative of mild to moderate central nervous system depression. Phenacetin and benadryl alone and in combination with CO as well as cessation of cigarette smoking alone or in combination with CO did not induce any changes in VER wave amplitude, latency, or configuration. (Author summary modified)

51033 **APTIC NO. 73153**

Medical College of Wisconsin, Milwaukee, Dept. of Environmental Medicine

EXPOSURE OF HUMANS TO CARBON MONOXIDE COMBINED WITH INGESTION OF ETHYL ALCOHOL AND THE COMPARISON OF HUMAN PERFORMANCE WHEN EXPOSED FOR VARYING PERIODS OF TIME TO CARBON MONOXIDE. *Coordinating Research Council, Inc. and Environmental Protection Agency Contract CRC APRAC, Proj. CAPM-3-68, Rept. CRC Air Pollution Research Advisory Committee MCOW-ENVM-CO-74-2, 40p., 1974 (?). 7 refs.*

The behavioral effects of various concentrations of carbon monoxide (30-200 ppm) alone and in combination with ethyl alcohol ingestion (1.5-1.6 ml/kg body weight) were examined, using human subjects (13 males and one female) ranging in age between 20 and 26 yr. Two sets of experiments were performed to compare the effects of 24-hour and 5.5-hour CO exposures under identical conditions. Steady state carboxyhemoglobin saturation during the 24-hour exposure tests was reached by the administration of 1200 ppm CO during initial 30-minute period. Data obtained from tests of coordination, arithmetic ability, inspection, manual dexterity, time estimation, and vigilance during both series of tests did not reveal any deleterious effects produced by CO either alone or in combination with alcohol. The only positive result was the adverse effect of alcohol on eye-hand coordination.

1973

51034 **APTIC NO. 67167**

Cinkotai, F. F.

THE BEHAVIOR OF THE TIDAL-RESIDENTIAL INTERFACE IN A MODEL ALVEOLAR SAC. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 132-136. 34 refs. (Oct. 17-18.)*

The behavior of the tidal-residential interface in the alveolar region of the human lung was studied using a simple latex model of an alveolar sac filled with viscous silicone fluid. The model was rhythmically expanded and contracted to imitate the alveoli of the lung. The time and volume parameters of the expansion and contraction were chosen to maintain Reynold s number in the model at the alveolar value. Dyed layers injected into the model to visualize the tidal-residential interface were preserved from one cycle to another only if the model expanded and contracted a series of geometrically similar shapes. Assuming this applies to alveolar airflow, unless the alveolar region expands and contracts perfectly uniformly during breathing, the tidal and residential phase will mix. The deposition of small (0.1-1 micron) aerosol particles into the alveolar region of the lung depends not on their size, but on the extent of phase mixing. (Author abstract modified)

51035 **APTIC NO. 71216**

Izumi, Y., M. Fujita, A. Yabe, and T. Hattori

RETENTION AND DISTRIBUTION OF INORGANIC MERCURY (197HG, 203HG) IN THE HUMAN BODY AFTER SINGLE INHALATION. *International Radiation Protection Assoc., Oak Ridge, Tenn., Proc. Int. Radiat. Prot. Assoc., Int. Congr., 3rd, Washington, D. C., 1973, p. 1384-1389, 1974. 8 refs. (Sept. 9-14.)*

NTIS: CONF-730907-P2

The retention and distribution of inorganic mercury (197Hg and 203Hg) in the human body after a single inhalation by two men were determined. The subjects were monitored with a whole body counter on the 10th day after decontamination procedures. The biological half-lives in the entire body were about 33 days, which was shorter than those reported for organic Hg. The biological half-lives in the upper abdomen were 50 days. The Hg deposited mainly in the kidneys and in the liver. The activities of the Hg2O3 in the kidneys and in the liver were determined using the counting efficiencies obtained from a REHAB phantom. The total activities in the kidneys 10 days after inhalation were almost equal to those in the liver. The high concentration in the kidneys, about 5 times as high as that in the liver, suggested that the kidneys were the critical organ for the inhalation of inorganic Hg. (Author abstract modified)

51036 **APTIC NO. 72964**

Khristova, L. and G. Orlov

EFFECT OF SULFUR DIOXIDE ON THE DEVELOPMENT OF AN ANAPHYLACTIC REACTION IN GUINEA PIGS SENSITIZED BY AN IMMUNOSORBENT. *(Vliyaniyeto na serniya dvuokis v rkhu razvitiye na anafilaktichnata reaktsiya u morski svincheta, sensibilizirani s imunosorbent). Text in Bulgarian. Khig. Zdraveopazvane, 16(2):176-180, 1973. 23 refs.*

The effect of sulfur dioxide on the development of experimentally- induced anaphylaxis in guinea pigs inhaling antigenic aerosol (egg albumin) was studied. The animals were sensitized in advance with a complex of protein and sefadex (immunosorbent). Animals exposed for 60 min to SO2 showed more severe anaphylactic seizures immediately after aerosol provocation than did animals not exposed to SO2. The use of the immunosorbent resulted in the formation of large amounts of antibodies and prolonged antibody response, indicating the suitability of this method for sensitization.

51037 **APTIC NO. 70498**

Perrin de Brichambaut, C.

MEASUREMENT OF METEOROLOGIC PARAMETERS FOR BIOLOGICAL STUDIES. *(Mesure des parametres meteorologiques a des fins d etudes biologiques). Text in French. Meteorologie, no. 28:51-55, Oct.-Dec. 1973.*

The necessity of selecting the proper parameters, equipment, and methods of data collecting is discussed. The five factors to be considered are: climate; statistics; space; local or regional atmospheric air; and biological interest. The meteorological parameters should be arranged into five columns. For climatic interest, the following symbolic notations should be used: xx for essential; x for notable; and O for negligible or doubtful. For actual statistical availability, the symbols to be used are: xx for easily disposable; x for seldom accessible; and O for practically inexistent. The greater the surface studied, the more accurate the results. The spatial factor may be: xx for extensive (10 to 50 km); limited (at 10 km); and very limited (less than 2 km). The effect of a meteorological factor upon residential areas differs from its effect upon free atmospheric air. The correlations must be established which exist between the values for the given parameter when measured in a residential area and values for the air in the immediate vicinity of the residential area. The symbols used for noting the effects are: xx for direct; x for possible or weak; and O for barely discernible or inexistent. Cooperation between meteorology and biology is considered essential. The parameter of biologic interest is noted by the following symbols: primordial; probable; and doubtful or negligible. The table mentioned helps characterize meteorological parameters.

51038 **APTIC NO. 70695**

Sawicki, Feliks

CHRONIC BRONCHITIS AND OBTURATION SYNDROME IN THE POPULATION OF THE CITY OF CRACOW. *(Przewlekly niezyt oskrzeli i zespol zaporowy wsrod mieszkancow Krakowa). Text in Polish. Pol. Arch. Med. Wewn., 50(9):883-893, 1973.*

The influence of smoking and high air pollution upon the incidence of chronic bronchitis and obturation syndrome were studied in 19 to 70 year old inhabitants of Cracow living in 1930 apartments selected based on questionnaires and anthropometric, spirometric, and X-ray analyses, accompanied by measurements of concentrations of small size dust and sulfur dioxide by aspiration. The obturation syndrome was found when the value of the FEV was lower than 60%. Manifestations of chronic bronchitis and/or obturation syndrome occurred in about 28,000 men and 14,000 women, i.e., 18.6% and 7.7%, respectively. Symptoms of chronic bronchitis were more frequent in men than in women (15 and 5%), due mainly to the fact that men smoked cigarettes more frequently, in greater number, and longer. No effect of smoking on the impairment of ventilatory functions were observed in women. The incidence of bronchitis in men and women was determined mainly by the duration of the smoking habit and the number of the cigarettes smoked. The effect of the duration of the habit was more significant than age. Two areas, D and Z, one less polluted, and one with high air pollution, were investigated. The mean values of percent forced expiratory volume were lower in men and women in the areas with high pollution. They were lowest in both men and women smoking for over 20 yr. In the population of area with high air pollution the incidence of chronic bronchitis was greater than in the less polluted areas.

51039 **APTIC NO. 70374**

Nagoya City Medical Assoc. (Japan)

AIR POLLUTION AND HEALTH INJURIES IN NAGOYA CITY, REPORT OF THIRD INVESTIGATION. *(Nagoya-shi ni okeru taiki osen to kenko shogai (dai 3 kai)). Text in Japanese. 16p., March 1973.*

An investigation was carried out on Oct. 18, 1972 on the awareness of injury by public nuisance and the health injuries of each of 30 inhabitants who visited a medical organization with complaints of any health injury. The percentage of awareness increased from the first investigation (32.3) to the third investigation (48.4), it was higher in the industrial area of the city. The frequency of the awareness due to gas, odor, and dust was respectively 22.5%, 17.5%, and 11.9%, all of them were larger than in 1971. The frequency of inhabitants with multiple occurrence of diseases due to public nuisance increased from 4.6% (1970) to 6.6% (1972). The frequency of cough symptoms continuing over 3 months and of sputum symptoms continuing over 3 months was less than in 1971. The frequency of occurrence of chronic bronchitic symptoms was also less than in 1971. The frequency of gasp symptoms was much less than in 1971. The frequency of colds, of headaches, and of mental exhaustion increased. Eye and throat irritation also increased.

51040 **APTIC NO. 70531**

Osaka Municipal Government, Bureau of Environmental Health, Japan

INVESTIGATION OF THE EFFECTS OF AUTOMOTIVE EXHAUST GASES ON THE HUMAN BODY, NO. IV - THE 1972 FISCAL YEAR INVESTIGATION. *(Jidosha haishutsu gasu jintai eikyo chosa IV - Showa 47 nendo chosa). Text in Japanese. 75p., June 1973.*

The effects of automotive exhaust gases on the human body were examined near the exit and entrance of the high speed expressway No. 43 near the Konohana district in Osaka and at an intersection of Sakurajima, Osaka. Measurement of the environment and subjective symptoms of residents were analyzed and health examinations were conducted. The wind direction, wind speed, sulfur concentration, carbon monoxide concentration, nitrogen oxide concentration, suspended particulates, lead in dusts, and tar were measured. A questionnaire on subjective symptoms was given to 800 residents. Health examinations were given to 68 residents. They consisted of stethoscopic examinations, blood pressure, chest X-ray, lung vital capacity, CO in exhalation, lung functions, cardiography, urinalysis, and hematological examinations. All pollutant levels were higher in the exposure area than the control area. Of the 268 responses obtained from the exposure area, 29.5% complained of eye irritation, while only 12.7% from the control area complained of this. For all the subjective symptoms included in the questionnaire except for the increase of nasal discharges and sneezing the ratio in the exposure area was significantly higher than that of the control area. For respiratory examinations, the rates of palpitation, panting, fatigue, and chest discomfort were higher in the exposure area; also such symptoms as trembling of the limbs, muscular spasms, irritability, melancholy, insomnia, memory lapses, and inability to concentrate were definitely higher in the polluted area.

51041 **APTIC NO. 70680**

Osaka Municipal Government (Japan), Bureau of Environmental Health

INVESTIGATION OF SCHOOLCHILDREN S RESPIRATORY FUNCTIONS BY EXAMINATION OF AIRWAY RESISTANCE. *(Gakudo kokyuki kido teiko kensa ni yoru chosa). Text in Japanese. 49p., May 1973.*

As a simple method for examining respiratory congestion in relation to air pollution, airway resistance was checked on 1116 fourth graders of eight schools in Osaka, and as a control group, 260 fourth graders of the unpolluted Takarazuka school. Their parents were given a questionnaire; measurements were taken on sulfur oxides, nitrogen oxides, carbon monoxide, dusts, the lead content in the dusts, the wind direction, the wind velocity, and tar; and the respiratory resistance examination was conducted by MRP meter. The resistance index was very low at the Takarazuka school; the averages of the eight Osaka schools showed a much higher resistance, although there were great variations. Within 95% reliability, there was a significant difference between the average of Osaka s eight schools and in the average of the Nagao (Takarazuka) School. Usually the greater height of the children, the lower the resistance; but there was no difference in the averages of Osaka, and almost no difference between the height and resistance of the control schoolchildren. The concentrations of various pollutants in Takarazuka were lower than Osaka, and average nitric oxide, dusts, lead, tar, and sulfur trioxide concentrations all showed the minimum values. There was no significant correlation between respiratory resistance and the concentrations of sulfur dioxide, nitrogen dioxide, and CO, but with the increase of degree of pollution, respiratory resistance seemed to increase. The frequency of bronchial asthma was between 10 and 12% in three schools in Osaka, and less than 5% in other schools. Coughing and wheezing rate in one Osaka school was 22%, and for other Osaka schools, between 13-14%. The respiratory resistance was not necessarily highest in the most polluted school in Osaka; but there was a definite geographical difference among schools. A slight correlation was noted between CO, NO2, and SO3 concentrations and the respiratory resistance, but there was no correlation between SO2, dusts, tar, and the lead content in the dusts and the respiratory resistance.

51042 **APTIC NO. 70687**

Osaka Municipal Government (Japan), Bureau of Environmental Health

INVESTIGATION OF THE EFFECTS OF AIR POLLUTION ON THE HUMAN BODY, OCTOBER 1972. *(Taiki osen no jintai eikyo chosa). Text in Japanese. 42p., June 1973.*

In parts of the Higashi-Yodogawa district of Osaka, which is adjacent to heavily polluted Toyonaka, and parts of the Sumiyoshi district, some men and women above 40 years of age and who had lived in the area for more than three years were given a questionnaire. Among the people who had subjective symptoms according to the questionnaire, those who were regarded as having chronic bronchitis were given health examinations by stethoscope, tests of blood pressure, weight, height, and lung ventilation, and chest X-rays. In the Higashi-Yodogawa district, winter morning coughs occurred 10.1% among men and 9.7% among women with an average of 9.9%. These figures were much lower than in the adjacent Toyonaka

(19.2%), and other heavily polluted cities like Kawasaki (17.3%), Fuji (14.6%), and Yokohama (13.5%). In the Sumiyoshi district, the answers were much higher: 16.5% for men, 16% for women, and 16.2% average. The combination of cough and sputum was 4.9% in the Higashi-Yodogawa, and 14.2% in the Sumiyoshi district, compared to 10% in Toyonaka, 8% in Kawasaki, 6.2% in Fuji, and 7.7% in Yokahama. In the Higashi-Yodogawa district, 179 persons (21.7%) received the chest X-rays and 54 were selected for detailed examination. Thirteen had hardening of arteries, five conjected lungs, five pulmonary swelling, four tuberculosis, two emphysema, and one each enlargement of heart and valvular disease. Among the 24 nonsmokers, two seemed to have obstructive lung disease. In the Sumiyoshi area, two enlarged heart and three hardening of arteries cases were found. During lung ventilation examinations of 24 men and 57 women, four had congestive conditions.

1972

51043 **APTIC NO. 70617**

Chen, Chentung, T. Nakajima, S. Kusumoto, Y. Tsubota, and E. Yonekawa

HISTOPATHOLOGICAL STUDIES OF THE REPAIRATIVE PROCESSES ON PATHOLOGICAL ANOMALIES IN THE RESPIRATORY SYSTEMS OF MICE EXPOSED TO NITROGEN DIOXIDE. *(Nisanka chisso bakuro ni yoru mausu kokyuki byohen no shufuku katei ni kansuru byori- soshikigakuteki kenkyu). Text in Japanese. Osaka Furitsu Koshu Eisei Kenkyusho Kenkyu Hokoku, Rodo Eisei-hen (Proc. Osaka Public Health Inst., Ed. Ind. Health), vol. 10:43-49, Sept. 1972. 5 refs.*

Fifteen male ICR-JCL mice were exposed to 1.0-1.5 ppm nitrogen dioxide three weeks after birth. Five mice were sacrificed just after, 1 month, and 3 months after exposure, the latter 10 mice being kept in a clean air room. The pharynx, larynx, and trachea were examined. In the mice sacrificed soon after the exposure, partial mucosal epithelial ablation and proliferation were seen in the trachea, and edematic submucosal tissue was seen with pharynx and trachea with nonconspicuous inflammatory cell infiltration. Focal ablation of the epithelial cover was seen in large bronchi with ablated epithelium and debris in smaller bronchi. Irregular expansion was seen in alveolar cavity; without exudates or infiltration of inflammatory cells. Mice kept in a clean atmosphere for 1 month after exposure showed lymphatic and monocytic cell infiltration in mucosal and submucosal layer of the trachea. Ablation and degradation of mucosal epithelium of the bronchi were noticed with clogged cavities of bronchus cavities and expansion of alveolar cavity; however, no infiltration of alveolar septum and stroma by inflammatory cell was noted. Mice kept for 3 months in a clean room after exposure showed an improvement of lymphocytic infiltration. Ablation was still recognized in the larger bronchi, but in many bronchioles the normal status was regained. Clogging of the bronchial cavity was still recognized lymphocytic infiltration surrounding the bronchioles.

51044 **APTIC NO. 73160**

Laurer, Gerard R., Theo. J. Kneip, McDonald E. Wrenn, and Merril Eisenbud

DESIGN AND CONSTRUCTION OF A DETECTION SYSTEM FOR DETERMINATION OF LEAD IN BLOOD USING LOW ENERGY X-RAY FLUORESCENCE ANALYSIS. *New York Univ. Medical Center, New York, Inst. of Environmental Medicine, Atomic Energy Commission Contract AT(11-1)3040, Rept. COO-3040-1, 68p., May 1, 1972. 14 refs.*

NTIS: C0030401

A method for the detection of blood lead levels in the normal range (0.2-0.4 ppm) from finger prick samples is described that can be used for mass screening applications. The system uses an X-ray fluorescence method with a unique radioisotope excitation source that allows a significant increase in sensitivity by increasing the source-sample-detector geometrical efficiency. The detection limit of the system is 0.26 ppm for sample volumes of 150 microliters (analysis time of 5 min), and projected detection limits indicate that a limit of 0.23 ppm (1-minute analysis time) is possible. Sample preparation involves centrifugation of the 150 lambda hematocrit tubes used to collect the blood sample. System requirements are described for mass screening, research, and automated modes. (Author summary modified)

51045 **APTIC NO. 71188**

Levy, R., Y. J. Chiu, and H. L. Cromroy

EFFECTS OF OZONE ON THREE SPECIES OF DIPTERA. *Environ. Entomol., 1(5):608-611, Oct. 1972. 3 refs.*

The action of high concentrations of ozone on the egg, larval, pupal, and adult stages of 3 species of Diptera (Musca domestica L., Stomoxys calcitrans (L.), and Drosophila melanogaster Meigen) was investigated to determine possible effects of the oxidant on molting and metamorphosis. Ozone concentration was controlled by altering the voltage impressed across an ultraviolet bulb and its series ballasts (a 40 watt light bulb) using an autotransformer. In all experiments the voltage settings were at maximum ozone output (i.e., 140 volts), with the exposure time varying from 4-8 hr for immatures and 96 hr for adults. Ozonation of freshly laid eggs resulted in a 15-17% inhibition of egg hatch in M. domestica and S. calcitrans. First-, second-, and third-stage larvae were observed after the same time in jars containing ozonated and normal flies. Pupation and emergence of adult flies in the ozonated and control groups also occurred after the same time period. No malformations or abnormalities were noted in the ozonated groups. Experiments involving the transfer of D. melanogaster ozonated eggs to Drosophila rearing media revealed synchronized egg hatch, pupation, and adult emergence in both test and control groups, indicating no apparent alteration in the normal sequence of the life cycle. Ozone exposure in the adult stage seemed to stimulate oviposition and resulted in a dramatic increase in the number of eggs laid and a significant increase in adult populations compared with controls.

1971

51046 **APTIC NO. 70770**

Collier, Carol

ON BREATHING SULFUR DIOXIDE. *In: Our World in Peril: An Environmental Review. Sheldon Novick and Dorothy Cottrell (eds.), New York, Fawcett World, 1971, p. 374-376.*

A study concerning the incidence of severe respiratory illness among groups of elderly patients with chronic lung conditions in relation to daily sulfur dioxide levels is reviewed. Analyses of personal pollution indices for sulfur dioxide and daily records of respiratory attacks for residents in the urban Chicago area (November and December 1967) revealed that patients aged 55 yr or more with severe cases of bronchitis tended to have more attacks of severe respiratory disease on high pollution days. This increase in illness rate either appeared on thye day of exposure or, more consistently, on the day following exposure. The severity of the attacks was also increased during high sulfur dioxide levels.

51047 **APTIC NO. 70771**

Myer, Judith G.

THOSE AIRBORNE CHEMICALS. *In: Our World in Peril: An Environmental Review. Sheldon Novick and Dorothy Cottrell (eds.), New York, Fawcett World, 1971, p. 377-381.*

Studies are cited concerning the carcinogenic and mutagenic effects of air pollutants such as benzo(3-4)pyrene. Epidemiological studies reveal regional differences in respiratory cancer mortality patterns which appear to be associated with increases in urbanization and airborne pollutants. Skin tests of rodents painted or injected with extracts of air pollution also point to the carcinogenic effects of pollutants, as evidenced by the development of local cancerous tumors. The importance of multiple factors in lung cancer is demonstrated by the development of tumors in the lungs of mice exposed to ozonized gasoline after being infected with influenza virus. Neither agent alone achieves the same effect. Tests with laboratory rodents receiving 22.5-30 mg benzo(3-4)pyrene reveal 20-fold increases in mutagenicity.

51048 **APTIC NO. 70769**

Selikoff, I. J.

ASBESTOS. *In: Our World in Peril: An Environmental Review. Sheldon Novick and Dorothy Cottrell (eds.), New York, Faucett World, 1971, p. 362-373. 10 refs.*

Occupational and nonoccupational exposure to asbestos is reviewed in terms of mortality statistics, autopsy findings, and incidence of respiratory and gastrointestinal cancers. In one study of 632 asbestos workers, a 20% increase in mortality over the expected figure was found, with 45 deaths being due to cancer of the lung and pleura as compared to an expected figure of six or seven. Autopsies of non-occupational exposed residents of major cities reveal the presence of asbestos bodies in percentages that suggest a much more widespread hazard than previously thought. Among 1975 New York City dwellers without occupational exposure, asbestos bodies were found in 942 cases. Studies among smoking and nonsmoking asbestos workers reveal greatly increased incidences of bronchogenic carcinoma among smokers, suggesting that inhalation of asbestos fibers among the general population might carry a special risk for cigarette smokers.

51049 **APTIC NO. 70772**

LEAD IN THE SLUMS. A SUMMARY OF ENVIRONMENTAL SPECIAL ISSUE APRIL 1968. *In: Our World in Peril: An Environmental Review. Sheldon Novick and Dorothy Cottrell (eds.), New York, Fawcett World, 1971, p. 382-410. 35 refs.*

Lead contamination of urban environments is reviewed with particular emphasis on lead poisoning among preschool slum children. Lead poisoning occurs in 5-10% of slum children, aged 1 to 6 yr, although many subclinical cases are not being detected. The amount of lead mined and introduced into the relatively small urban environments each year is estimated at more than 100 times greater than the amount of natural lead leached each year from soil by streams and added to the oceans over the entire earth. The atmosphere of the northern hemisphere appears to contain about 1000 times more than the natural amount of lead. A conservative estimate of average lead concentrations in urban atmospheres is about 1.3 micrograms/cu m as compared to 0.05 microgram/cu m for rural atmospheres. The principal source of airborne lead is tetraethyl lead which is used in gasoline as an anti-knock agent. About 25-55% of this lead comes out of the exhaust, with 1/2 to 2/3 being in particulate form and the remainder in gaseous form.

1957

51050 **APTIC NO. 70214**

Filatova, V. S. and E. S. Gronsberg

SANITARY-HYGIENIC CONDITIONS OF WORK IN THE PRODUCTION OF POLYCHLORVINYLIC TAR AND MEASURES OF IMPROVEMENT. *(Sanitarno- gigienicheskie usloviya truda v proizvodstve polikhlorvinilovoy smoly i mery ikh ozdorovleniya). Text in Russian. Gigiena i Sanit., 1957:38-42, 1957. 4 refs.*

Analyses of vinyl chloride in air of workrooms where polychlorvinylic tar is produced revealed concentrations between 0.05 and 0.8 mg/l. Hermetic sealing of work equipment and installation of ventilation systems near the reactors lowered the concntration to below 0.05 mg/l. The vinyl chloride vapors were virtually eliminated following substitution of drying oven chambers with equipment designed to prevent the release of the vapo . Toxic angioneurosis among workmen in such areas was observed at vinyl chloride concentrations below the maximum allowable value, illustrating the importance of reconsidering the maximum allowable vinyl chloride concentration for work places.

EFFECTS-PLANTS AND LIVESTOCK

1975

51051 **APTIC NO. 70729**

Yamazoe, F.

AIR POLLUTION AND PLANTS, MAINLY ON THE POLLUTANTS AND PLANT DAMAGES DUE TO THEM. *(Taiki osen to shokubutsu osen busshitsu to shokubutsu higai o shuto shite). Text in Japanese. MOL, 13(2):49-55, Feb. 1975. 8 refs.*

The air pollutants which cause injuries to plants mainly by direct contact are classified by their chemical actions as follows: oxidative such as ozone, peroxyacetyl nitrate (PAN) and its homologues, nitrogen dioxide, and chlorine; reductive such as sulfur dioxide, aldehydes, hydrogen sulfide, and carbon monoxide; acidic such as hydrogen fluoride, silicon tetrafluoride, hydrogen chloride, sulfur trioxide, hydrogen cyanide, and mists of sulfuric and nitric acid; alkaline such as ammonia; other organic substances such as unsaturated hydrocarbons; and solid minute particles. The order of toxicity of air pollutants were grouped as fluorides, chlorine, ozone, PAN, and ethylene; sulfur oxides and nitrogen oxides; and aldehydes, ammonia, hydrogen cyanide, chloride, and sulfide. The absorption and the characteristic symptoms of representative air pollutants are described. The utilization of plants as an air pollution index and the selection of resistant plants to air pollution are explained with examples.

1974

51052 **APTIC NO. 70605**

Bazzaz, F. A., Roger W. Carlson, and G. L. Rolfe

THE EFFECT OF HEAVY METALS ON PLANTS: PART I. INHIBITION OF GAS EXHANGE IN SUNFLOWER BY PB, CD, NI AND TI.. *Environ. Pollut., 7(4):241-246, Dec. 1974. 16 refs.*

Measurements of net photosynthesis and transpiration were made on detached sunflower leaves (Helianthus annuus L.) exposed to various concentrations (0-200 ppm) of the heavy metals lead, cadmium, nickel, and thallium. Net photosynthesis was reduced with increasing concentrations of the metals and duration of exposure. High concentrations of Cd, Ni, or Tl caused more rapid photosynthesis reductions than high concentrations of Pb which caused similar reductions at all concentrations. Plants treated with 2 and 20 ppm Cd or 2 ppm Tl were similar to their controls. Net photosynthesis was decreased by 40% after 4 days of exposure for all 100 and 200 ppm treated plants, except those exposed to Pb. Plants treated with Ni or Tl appeared wilted after one or two days, though the leaf water potential as well within the range at which photosynthesis is not inhibited by water stress. Plant leaves treated with 100 or 200 ppm Cd showed bending at the petiole; Pb-treated plants were similar to controls in appearance at all treatment levels. A similarity between reduction in net photosynthesis and transpiration as function of heavy metal content suggested that stomatal function was inhibited. The degree of stomatal opening decreased log- linearly with increasing concentrations of the metals, with Tl being the most effective.

51053 **APTIC NO. 72987**

Capp, John P. and Donald W. Gillmore

FLY ASH FROM COAL BURNING POWERPLANTS: AN AID IN REVEGETATING COAL MINE REFUSE AND SPOIL BANKS. *Preprint, National Coal Assoc., Washington, D. C., 12p., 1974. 10 refs. (Presented at the Coal and the Environment Technical Conference, Louisville, Ky., Oct. 22-24, 1974.)*

The use of fly ash from coal burning power plants to revegetate coal mine refuse and spoil banks is discussed. Experiments with grasses, trees, and various agricultural crops indicate that the alkaline fly ash serves to neutralize highly acid spoils such that the fly ash-spoil mixtures support vegetation in areas previously bare for many years. The amount of fly ash to be added to a soil is determined empirically by measuring the pH of various fly ash-spoil mixtures and plotting the results. Mixing of the fly ash and spoil is accomplished by plows and discs, with the plowing being performed several times if necessary to attain adequate mixing. In addition to the neutralizing effect of fly ash in acidic soils, increased crop yields following fly ash application are also the result of trace metals contained in the ash.

51054 **APTIC NO. 73062**

Curtis, C. R., H. G. Gauch, and R. Sik

SODIUM AND CHLORIDE CONCENTRATIONS IN NATIVE VEGETATION NEAR CHALK POINT, MARYLAND. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 370-378, 1975. 16 refs. (March 4-6.)*

The sodium and chloride concentrations in leaves of various perennial woody species growing in the Chalk Point, Maryland area were measured to obtain background salt concentration data prior to the operation of cooling towers in the area. The majority of chloride concentrations fell within the range of 100-500 ppm; the reasons for variations in the concentrations within a given species and for various sampling dates and locations are not known, however. Sodium concentrations ranged between 100-950 ppm. Some of the lower values observed may have resulting from the leaching effect of rains. (Author abstract modified)

51055 **APTIC NO. 70607**

Davison, A. W., A. Marsland, and W. E. Betts

A PROPOSED RAPID TEST FOR SUSCEPTIBILITY TO GASEOUS FLUORIDES. *Environ. Pollut., 7(4):269-282, Dec. 1974. 11 refs.*

A rapid test for determining plant susceptibility to gaseous fluorides is proposed based on the use of cut leaves and fluoride solutions. Mature, nonsenescent leaves of Iris germanica, Ligustrum vulgare, and Poa annua were placed in fluoride solutions of 0, 5, 10, 25, 50, and 100 microgram/ml solutions to establish a standard procedure. The percentage of leaf area showing necrosis was directly related to the fluoride solution concentration, with Poa developing the greatest degree of necrosis and Ligustrum the least. Experiments with barley and maize showed that damage was much greater after 24-hour exposures as compared to 8-hour exposures. Barley, which is relatively resistant to fluoride, required more than 8 hr to show significant damage, suggesting that long exposure may be necessary to cause damage in more resistant species. Experiments with young and mature leaves of Zea mais showed that necrosis was greater in the latter after 48 hr of fluoride treatment. Experiments with compound leaves revealed relatively little damage to lucerne leaves exposed to 100 microgram/ml fluoride, whereas soybean exposed to 50 microgram/ml fluoride exhibited typical water-soaked areas and necrosis. Covering the tips of mature barley leaves with petroleum jelly before fluoride treatment resulted in a shift of maximum fluoride accumulation from the tip to areas immediately adjacent it. Overall, the percentage of necrosis was slightly reduced. Significant differences to fluoride susceptibility were noted for maize, barley, and wheat; these differences paralleled the susceptibility of the species to atmospheric fluoride. Significant intraspecies, differences in fluoride susceptibility were observed for Zephyr, Sultan, and Julia.

51056 **APTIC NO. 70330**

Heagle, Allen S. and W. W. Heck

PREDISPOSITION OF TOBACCO TO OXIDANT AIR POLLUTION INJURY BY PREVIOUS EXPOSURE TO OXIDANTS. *Environ. Pollut., 7(4):247-252, Dec. 1974. 8 refs.*

The effects of continuous versus daily exposure of Nicotiana tabacum L. cultivars (Bel W3) to ambient oxidants (primarily ozone) were investigated using charcoal-filtered and non-filtered growth chambers. Although the oxidant dose for the continuous exposure group was identical to the total dose for the daily exposure group, the mean percentage of new oxidant injury per leaf and oxidant index over an 8-week study period was 37.2% for the former as compared to 16.2% for the latter. Control plants held in the filtered growth chamber two weeks were not injured. An exception to the usual predisposition pattern occurred during the sixth week when severe foliar injury developed early in the week on plants in the continuous exposure group. Subsequent injury in this group was minor, perhaps because of a lack of noninjured susceptible tissue or because of some physiological alteration such as partial closure of stomata in noninjured areas. The predisposition mechanism generally observed was not understood. It may have been due to a slow accumulation of toxic substances, a slow degradation of cell membranes, a gradual interruption of enzyme systems, or a combination of these or other mechanisms.

51057 **APTIC NO. 70345**

Honda, H.

TREE PLANTING AROUND FACTORIES AND THE SUITABLE KINDS OF TREES FOR IT. *(Kojo ryokka to sono tekisei shokubutsu). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(5):1726-1730, May 1974.*

Many important factors affect plant damage including the nature of pollutants, the atmospheric conditions under which pollutants are emitted, the physiological conditions of plants, and the cultural conditions to keep the plants. In fact, the features of damage become extremely complicated by the combination of these factors. The mechanism of the occurrence of damage is as follows. Gaseous pollutants invade through stomata in epidermal tissue and part of them enters into the body through water pores situated at the point of leaves or in the leaf margin. Since the number of stoma is much greater than that of water pores, the amount of damage depends on not only the internal conditions of leaves, but also on the size, distribution, structure, and opening and closing of stoma. The symptoms of damage in plants are visible external changes and invisible internal changes. The resistivity of plants against pollution can be studied by two methods. One is the observation of plants in the laboratory, the other is actual research around polluted districts. The deciduous broad leaved group is much more sensitive than the evergreen broad leaved group.

51058 **APTIC NO. 73121**

Huckabee, J. W. and B. G. Blaylock

MICROCOSM STUDIES ON THE TRANSFER OF HG, CD AND SE FROM TERRESTRIAL TO AQUATIC ECOSYSTEMS. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 219-222. 6 refs. (June 11-13.)*

Microcosm tanks containing excised stream bank sections, stream sediments, biota, and spring water were used to study the transfer of mercury, cadmium, and selenium from terrestrial to aquatic ecosystems and to identify target organisms and sinks. Fish (Gambusia affinis) and snails (Goniobasis clavaeformis) were placed in the aquatic portion of the tanks, and a radioactive tracer was applied to the terrestrial portion via simulated rainfall. Labeled mercury from coal fly ash was leachable, with about 50% of the total reaching the aquatic system; more than 99% of the mercury was in the sediments. Fish accumulated more of the metal than did snails. Selenium and cadmiun transfers from terrestrial to aquatic ecosystems were slow compared to that for mercury. Only about 4% of the initial cadmium was transported to the aquatic portion of the microcosm. Fish assimilated cadmium more slowly than snails. Over 75% of the selenium was retained in the soil, with 9% of the metal being found in the sediments. Fish accumulated only 0.007%, about 10 times less than that accumulated by snails. (Author abstract modified)

51059 **APTIC NO. 70357**

Itai, K., F. Tsunoda, and S. Sakurai

ON THE DETERMINATION OF FLUORINE IN BROWN RICE. *(Genmai-chu fusso no teiryo-ho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):373, Nov. 1974.*

As the air pollution threat due to fluorine has increased, the content of fluorine in crops for food and feed has become important. Previous methods of determining fluorine in rice gave considerable fluctuation. A newly established method of fluorine determination in rice is therefore described. The route of analysis consists of keeping brown rice in calcium hydroxide for 24 hr, then evaporating it to dryness, and calcinating the rice in a crucible at 550 C. The ashes are added to concentrated sulfuric acid with a small amount of silver sulfate and aqua regia and steam-distilled at 137 + or - 5 C. The 10 ml aliquot of 250 ml of distillate was determined for fluoride ion by the fluoride ion meter. Recovery of fluorine was 92-103.2%.

51060 **APTIC NO. 70705**

Matsuoka, Y., T. Takahashi, M. Morikawa, K. Shiratori, and H. Yoda

EFFECTS OF COMPOUND POLLUTION BY PHOTOCHEMICAL OXIDANT ON VISIBLE INJURIES OF PLANTS. *(Okishidanto kashishogai no oyobosu fukugo-osen no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):367, Nov. 1974.*

A phenomenon which was possibly caused by compound air pollution was observed in a plant growing room into which ambient air could freely and continuously enter and in which Colocassia antiquaram and peanut plants were grown. The injuries on the two plant species appeared July 18, and Aug. 8, 13, 21, and 29; the date of generation of the air pollution was possibly July 18, and Aug. 8, 12, 20, and 28. The cause of these injuries could have been photochemical oxidant, predominantly consisting of ozone. The severeness of injuries on both plants were often different, and sometimes the degree of injuries was reversed. The injury on Colocassia antiquarum on June 21 showed a relationship to sulfur dioxide c oncentration. These facts show the effects of compound pollution on plants, the effects being severe Colocassia antiquarum but peanut was affected mainly by the concentration of ozone.

51061 **APTIC NO. 70738**

Matsuoka, Y., T. Takasaki, M. Morikawa, and T. Matsumaru

THE CHARACTERISTIC SYMPTOMS AND COURSE OF DAMAGE APPEARANCE OF VISIBLE INJURIES ON PLANTS DUE TO PHOTOCHEMICAL OXIDANTS. *(Okishidanto kashishogai no tokucho to hassei-keika). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):366, Nov. 1974.*

The progrss of oxidant damage to plants was observed by the naked eye and by a histological method on every position of exposed plant leaves. The experimental plant (tobacco, Bel W-3) was potted and grown in a growth cabinet, kept outdoors on days when the occurrence of oxidants could be forcast from 9:00 to 17:00, and again kept in the cabinet. The oxidant concentration was 10 pphm on the average from 10:00 to 14:00. The progress of the damage was as follows: initial symptoms appeared on the ninth leaf of 16 leaves as minute oil-immersed spots of dark green color after 3 hr of exposure: the spots became recognizable and depressed from the periphery after 5 hr; the number of spots increased and the size enlarged to a few mm in diameter changing to brown in color, and they appeared to be dehydrated. The progress of the damage stopped during the next day after exposure, the spots becoming greenish brown in color. The damaged area enlarged from the middle to top and bottom. Microscopically, a first sign of necrosis was recognized at the upper surface of the palisade parenchyma; and when the oil- immersed spots were observed, the palisade parenchyma became remarkabley destroyed.

51062 **APTIC NO. 70372**

Moriya, K., F. Oya, S. Ochiai, and T. Mukaida

STUDY EVALUATION OF AIR POLLUTION FROM A BIOLOGICAL INDEX (3). SPECIES DIVERSITIES OF INSECTS COLLECTED BY LIGHT TRAPS. *(Seibutsushihyo ni yoru taikiosen no chiikihyoka ni kansuru kenkyu (Dai 3 hou) yusatsutou ni hoshu sareta konchu no tayousei- shisu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):387, Nov. 1974.*

Utilizing the principle that accompanying the aggravation of environment, the diversity of living things decreases and only the species which could survive in such environment increase in number, insects were simultaneously collected by light traps placed at 23 local points two times per month from May to Oct. 1973. Of the collected insects, those numerous in species, in individuals, and actually numerous in nature were identified. Total number of moths was 9464 of more than 400 species. The index of diversity was calculated by the formula of Brillouin which does not depend on the quantity of samples. The indexes plotted on the map of Kanagawa Prefecture gave the same image as the environmental condition.

51063 **APTIC NO. 73061**

Moser, Bruno C.

AIRBORNE SEA SALT: TECHNIQUES FOR EXPERIMENTATION AND EFFECTS ON VEGETATION. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 353-369, 1975. 11 refs. (March 4-6.)*

Levels of airborne sea salt and its sedimentation rate were measured at different distances inland from the New Jersey coast. Both air concentration and sedimentation rate decreased rapidly within the first km; the former dropped from an average of 140 micrograms/cu m near the shore to about 10 micrograms/cu m at 1 km distance, while the latter dropped from about 40 micrograms/sq m/sec to less than 5 micrograms/sq m/sec. Vegetation damage was observed in a zone up to 375 m from the surf during a weather pattern that resulted in salt levels three times higher than any other peak levels measured. Wind tunnel and sedimentation chamber experiments designed to reproduce ambient conditions revealed that sodium and chloride uptake into bean leaves was proportional to the length of exposure time. Salt uptake and plant injury also increased as the level of airborne salt was increased. Sea salt uptake was the greatest when the bean plants were held under high humidity conditions (80% relative humidity). White pine plants were injured by a 48-hour exposure to airborne salt levels similar to near surf conditions, while Japanese black pine showed no injury under the same conditions. (Author abstract modified)

51064 **APTIC NO. 73063**

Mulchi, Charles L. and James A. Armbruster

EFFECTS OF SALT SPRAYS AND THE YIELD AND NUTRIENT BALANCE OF CORN AND SOYBEANS. *State of Maryland, Power Plant Siting Program and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Cool. Tower Environ. Symp., College Park, Md., 1974, CONF-740302, p. 379-392, 1975. 14 refs. (March 4-6.)*

The effects of cooling tower salt spray on corn and soybean crops were simulated by spraying plots of each crop with sodium chloride solutions of 1.82, 3.64, 7.28, or 14.56 kg/hectare/wk for 8 wk. The concentrated NaCl solutions were employed to attain mist droplets approaching maximum salt saturation. Extensive leaf damage was induced by the two highest concentrations for both crops. Younger soybean plants were more sensitive than older plants, while the opposite was true for corn plants. Although young soybean plants were stunted to a larger degree than young corn plants, the soybean plants appeared to recover from the initial acute effects as the plants matured. Vegetative damage to the corn plants was progressive with both the quantity of salt applied and with time. The metabolic index for both plants, a measure of the balance of nutrients in tissue, was significantly decreased by the salt-spray treatments. Soybean and corn yields were reduced by 18 and 39%, respectively, in comparison to controls after maximum salt treatments. Sodium levels in the soils were significantly increased. (Author abstract modified)

51065 **APTIC NO. 70742**

Nouchi, I., T. Sawada, T. Ohashi, and T. Ohira

DAMAGE SYMPTOMS OF PLANTS DUE TO PAN EXPOSURE. *(Shokubutsu no PAN bakuro ni yoru higai jyokyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):363, Nov. 1974.*

In order to identify the cause of plant damage which differed from that by ozone, a series of exposure experiments was carried out on Beta vulgaris, Japanese radish, French bean, luthern, tomato, and spinach in a controlled weather room by artificially synthesized PAN (peroxyacetyl nitrate). The damage appeared generally on younger leaves as a lustering and bronzing on the lower surface; there was a specific symptom in which the interveinary part of the lower surface depressed, leaving the veins in relief. At higher concentrations of PAN, damages appeared on the upper surface of leaves, however, bronzing and lustering were clearer during exposure to lower concentrations of PAN. The position of the leaves and the part of a leaf which was damaged were constant in the petunia, morning glory, and tobacco. There was a hyperbolic relationship between the concentration of PAN and the time period of appearance of the damage as was seen during sulfur dioxide and ozone exposures.

51066 **APTIC NO. 70508**

Odaira, T., T. Sawada, N. Date, T. Iijima, and K. Terakado

SURVEY AND INVESTIGATION ON THE EFFECTS OF PHOTOCHEMICAL SMOG BY MORNING GLORY. PART I/II. *(Asagao ni yoru kokagaku sumoggu eikyo ni kansuru chosa kenkyu (jo)). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(6):1821-1844, June 1974.*

Plant damage due to ozone produced by photochemical smog was investigated in Tokyo from June to Sept. 1973 using two varieties of morning glory, one ozone-susceptible, Scarlet O Hara, and the other less susceptible, Violet. The major symptoms were noticeable bleach spots on the leaves of Scarlet O Hara at exposures of 15 + or - 2 pphm ozone for 4 hr (dose of 60-70 pphm- hr) and necrosis of leaves of Violet at exposures of 15 + or - 2 pphm ozone for 6 hr (dose of 90-110 pphm-hr). The total area of Tokyo was divided into meshes of 5 km, and in each mesh one or two middle schools were studied where morning glory was grown. Damage due to ozone in photochemical smog certainly occurred when oxidant dose was more than 60 pphm-hr for 8 hr from 9 am to 4 pm; this kind of damage did not occur when oxidant dose was less than 50 pphm-hr for 8 hr from 9 am to 4 pm. A difference of susceptibility was observed in the laboratory between Scarlet O Hara and Violet; in fields there was no difference in oxidant dose which gave damage to Scarlet O Hara and Violet. There were cases of no damage in spite of high concentrations of oxidant, according to the growth stage of the morning glory. The local tendency of the first occurrence of ozone damage in the morning glory was precisely investigated and ascertained.

51067 **APTIC NO. 70509**

Odaira, T., T. Sawada, N. Date, T. Iijima, and K. Terakado

SURVEY AND INVESTIGATION ON THE EFFECTS OF PHOTOCHEMICAL SMOG BY MORNING GLORY, PART II/II. *(Asagao ni yoru kokagaku sumoggu eikyo ni kansuru chosa kenkyu (ge)). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(7):1972-1981, July 1974. 12 refs.*

Damage to morning glory plants was investigated by local distribution and degree in the cases of broad area pollution by high oxidant concentrations during July 6-10, July 13-19, and Aug. 5-12, 1973. A further investigation was carried out by specialists during July 16-20 and Sept. 21. During July 6-10, July 13-19, and Aug. 5-12 the damage was seen in more than 90% of middle school plants. On Scarlet O Hara plants, the local spots with higher damage were 63% at the middle school. The cumulated percentage of damaged leaves was more than 50% in every school. The plant damage due to the major component of photochemical oxidant, ozone, was not a pinpoint phenomenon, but rather covered an area with a diameter of 100 km with central part of Tokyo as the center.

51068 **APTIC NO. 70340**

Ota, Y.

EFFECTS OF ETHYLENE AS AN AIR POLLUTANT ON PLANTS. *(Taiki osen busshitsu to shiteno echiren no shokubutsu ni oyobosu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):374, Nov. 1974.*

Ethylene, which causes a variety of plant growth regulating actions, has recently been noticed as an air pollutant exhausted from factories and motor vehicles. The atmospheric concentration is very low, and it is very difficult to ascribe the plant damage to ethylene in the presence of many other air pollutants. However, considering the action of ethylene of a very minute amount, there is a possibility that the minute amount of ethylene in the atmosphere might have affected plant life, resulting in undesirable changes such as early leaf-fall, leaf-yellowing, abnormality and early drop of fruits, abnormal influorescence, and epinasty.

51069 **APTIC NO. 70370**

Oya, F., J. Yoshida, S. Ochiai, and N. Kadoya

STUDY ON THE EVALUATION OF AIR POLLUTION FROM A BIOLOGICAL INDEX (1). RELATIONS BETWEEN FOREST ACTIVITY AND AIR POLLUTION. *(Seibutsu-shihyo ni yoru taikiosenhyoka ni kansuru kenkyu (Di 1 hou) jumoku-kaseido to taikiosen tono kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):385, Nov. 1974.*

In Kanagawa Prefecture, 16 places were selected in public gardens, greens, shrines, and temples, and 10-40 trees of five species, zelokova, ginkgo, cherry, quercus, and pine were adopted as biological indicators of air pollution. The activity of the indicator was decided by several botanical parameters; it was divided into four classes. According to the general survey, there was a local difference of activity, very low in the surrounding areas of the industrial zone of Yokohama and Kanagawa, and higher at increasing distances from the industrial zone. There was a considerable correlation between the activity and atmospheric concentration of sulfur dioxide. No relationship was found between the activity and the oxidant concentration.

51070 **APTIC NO. 70371**

Oya, F., S. Ochiai, N. Kadoya, and M. Maeno

STUDY ON THE EVALUATION OF AIR POLLUTION FROM A BIOLOGICAL INDEX (2). RELATIONS BETWEEN FOREST ACTIVITY AND PHOTOGRAPHIC CONCENTRATION FROM A MULTIBAND CAMERA. *(Seibutsu shihyo ni yoru taiki osen hyoka ni kansuru kenkyu (Dai 2 hou) jumokukaseido to maruchibandokamera ni yoru shashin nodo tono kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):386, Nov. 1974.*

The relationship between the activity of trees and the photographic density taken by a multiband camera was examined to use the results in evaluating air pollution. Aerial photographs of trees at 16 points of Kanagawa Prefecture were taken by a multiband camera in Sept. 1972, Aug., and Oct. 1973 from a height of 500 m, and a scale of 1/5000. The determination of photograph density was obtained from negative film of multibands of blue, green, red, and infrared. There was high correlation between blue/infrared and red/infrared on every tree species, on the film taken in Aug.

51071 **APTIC NO. 70746**

Pearson, R. G., D. B. Drummond, W. D. McIlveen, and S. N. Linzon

PAN-TYPE INJURY TO TOMATO CROPS IN SOUTHWESTERN ONTARIO. *Plant Disease Rept., 58(12):1105-1108, Dec. 1974. 9 refs.*

Investigations of unusual foliar injury development on tomato crops on southwestern Ontario during 1972 and 1973 indicated widespread peroxyacetyl nitrate (PAN)-type injury on rapidly growing, succulent, middle-aged foliage of recently transplanted field tomatoes. The injury symptoms ranged from undersurface silvering, glazing, and bronzing to bifacial necrosis accompanied by leaf rolling. Histopathological examination revealed cellular injury only in the lower epidermis and adjoining spongy mesophyll layers. A review of weather records for locations in Ontario and to the south of lake Erie in Ohio showed that weather conditions were favorable for the formation and transport of photochemical oxidants monitored in industrial areas such as Cleveland prior to the development of tomato plant injury in Ontario. (Author abstract modified)

51072 **APTIC NO. 70774**

Sakihara, K., A. Sugimae, S. Hanai, and K. Matsuo

ON THE EFFECTS OF DUST ON TRESS PART 1. ANALYTICAL RESULTS OF ELEMENT CONTENTS IN ANNUAL RINGS OF PINE TREE. *(Funjin no jyumoku eno eikiyo ni tsuite dai 1 hou shitsuryo bunseki-ho ni yoru matsu no nenrin-chu no genso ganyuryo no bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):369, Nov. 1974.*

The contents of elements in the annual rings of pine trees grown in industrial and control areas were determined by mass spectroscopy. Three patterns of distribution of elements were observed: those becoming lower in the outer rings such as lead; those without any difference in each ring such as magnesium; and those becoming higher in the outer rings such as nickel. Cadmium showed the same pattern as lead, and aluminum, manganese, and barium showed the same trend, but not as marked as lead and cadmium. Sodium, calcium, strontium, silicon, zinc, arsenic, chlorine and bromine belonged the same pattern as magnesium, but not as markedly. Sulfur, phosphorus, vanadium and nickel belonged to the third pattern. When the trends of vanadium and sulfur were compared locally, both elements showed a larger existence in outer ring, suggesting that these elements could be utilized as pollution indicators.

51073 **APTIC NO. 70745**

Sakurai, S., K. Itai, and F. Tsunoda

ON THE RELATION BETWEEN AIRBORNE AND FLUORINE IN PLANTS. *(Shokubutsu-chu fusonodo to taiki-chu fukkabutsu ni tuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):370, Nov. 1974.*

A high correlation between atmospheric fluoride and the fluoride content of plants was recognized using several methods. The AP method was used in determining atmospheric content of hydrogen fluoride. The concentrations of hydrogen fluoride; seasonal 1-hour averages highest seasonal values of monthly average values, daily average values, and 1-hour values were examined using the fluoride contents in brown rice and leaves of gladioli. There was a significant correlation between all the atmospheric fluoride values and the fluoride content of brown rice.

51074 **APTIC NO. 70737**

Sawada, S., N. Date, S. Fukuoka, T. Iijima, T. Yoneyama, and T. Ohira

ON THE PLANT DAMAGE DUE TO OZONE AND PAN AT THE OCCURRENCE OF OXIDANTS WITH HIGH CONCENTRATION. *(Konodo okishidanto shutsugenji ni okeru O3 oyobi PAN ni yoru shokubutsu kogai ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):364, Nov. 1974.*

A field survey of plant damage was carried out after a high occurrence of photochemical smog with a 1-hour average value of oxidant of more than O.3 ppm from May 17 to 19, 1974. The period of the survey was May 21-26. Sixteen species were investigated including spinach, Chinese cabbage, Beta vulgaris, a salt green, lettuce, Welsh onion, Japanese radish, turnip, French bean, and maize. The local highest degree of plant damage was designated the degree of the damage of the point, and the type of damage was divided into ozone type and PAN (peroxyacetyl nitrate) type. Because of the low value of oxidants for 20 days before the high occurrence, the damage was due to the occurrence of photochemical smog during the 3 days from May 17. On May 18, the maximum concentration of more than 20 pphm was recorded 80% of the stations. Generally the plant damage was the highest ever experienced. Of the 138 plants investigated, oxidant damage was recognized on 114 plants, and ozone damage on 92, and PAN damage on 39. Ozone type damage was marked on spinach, Chinese cabbage, and radish, and PAN type damage was marked on almost all plants. The places in which plant damage was severe were located in areas where oxidant concentrations were high.

51075 **APTIC NO. 70703**

Shiratori, K., Y. Matsuoka, T. Takahashi, M. Morikawa, and T. Matsumaru

SYMPTOMS AND LOCALITY OF DAMAGES ON PLANTS BY PHOTOCHEMICAL OXIDANT. *(Okishidanto shogai no shojyo to sono chiikisei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):365, Nov. 1974.*

Crop damage due to photochemical smog in June and July 1973 included a new type of injury on taro and peanut plants. On taro, the new symptoms were a feather form silvering of interveinal parts along the veins of leaves resulting in whitening of the whole leaf, as contrasted to the already reported feathering form necrosis of interveinal parts along the veins of leaves resulting in browning of the whole leaf. The two symptoms showed a clear locality. The new symptoms on peanut leaves were a white, spot-like chlorosis and brown necrosis near the veins with irregular form, as contrasted to the already reported minute white spots of chlorsis. The brown necrosis and white chlorosis had a clear locality. They were not due to pests and diseases but to air pollution.

51076 **APTIC NO. 70704**

Shiratori, K., T. Matsumaru, and T. Yashiki

THE EFFECTS OF PLANT VARIETIES AND CULTIVATION CONDITIONS ON THE OCCURRENCE OF VISIBLE INJURIES DUE TO OXIDANTS. *(Hinshu, shokubai-jyoken ni yoru okshidanto kashishogai no hatsugen teido). Text in Japanese. Taiki Osen Kenkyu. (J. Japan. Soc. Air Pollution), 9(2):368, Nov. 1974.*

Susceptibility of cultivated peanut and Japanese radish plants to naturally generated oxidant was examined with respect to variety, fertilization, and growth stage. The oxidants were generated on Sept. 24, and the average concentration was more than 0.1 ppm for 2 hr with the highest value 0.16 ppm. The concentration of sulfur dioxide was more than 0.1 ppm for 3 hr with a peak of 0.17 ppm. Considerable differences of varietal susceptibility were observed in peanut to ozone (represented by white minute spots on leaves) and to oxidants generally (represented by spots in which brown pigment precipitated). Some degree of such differences of susceptibility was also seen on Japanese radish. The nitrogen-poor fertilization gave more severe damage in Japanese radish, and the totally fertilized plants showed lighter damage. Susceptibility of the Japanese radish was the highest on the plants 25 days after sowing.

51077 **APTIC NO. 70732**

Shiratori, K.

FIELD SURVEY OF PHOTOCHEMICAL OXIDANTS INJURY ON VEGETATION OCCURRING IN SOUTHERN KANTO DISTRICTS. PART 2. RELATION BETWEEN DEGREE OF INJURY AND PHOTOCHEMICAL OXIDANTS DOSAGE. *(Minami Kanto chiki ni okeru okishidanto shokubutsu higai chosa, sono 2, shokubutsu higai no hassei to okishidanto nodo kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):360, Nov. 1974.*

The distribution of the degree of plant damage on Taro, spinach, Allium, and morning glory which grow broadly in Kanto district was studied. The degree of oxidant was classified into 10-14, 15-19, and more than 20 pphm. The exposure hours multiplied by the exposure amount was designated as the degree of pollution. When the plant damage and the degree of pollution by photochemical oxidant on three occasions (June 21, July 26 and July 15-18) were compared, the pollution and the distribution of plant damage showed a similar trend with a small noncorrelation, suggesting the existence of secondary factor of plant damage.

51078 **APTIC NO. 70550**

Soos, Katalin

CONTENT OF CARCINOGENIC POLYNUCLEAR HYDROCARBONS IN HUNGARIAN GRAIN. *(Gehalt an cancerogenen polyaromatischen Kohlenwasserstoffen in ungarischem Getreide). Text in German. Z. Lebensm. Unters Forsch. (Munich), 156(6):344-346, 1974. 11 refs.*

The content of carcinogenic polynuclear hydrocarbons in Hungarian grain (16 wheat, 1 rye, and 11 barley samples) was determined. The polyaromatics were extracted twice with boiling benzene and once with boiling methanol according to Grimmer and Hildebrandt. They were then purified and determined by means of ultraviolet spectrophotometry. As expected, the contamination of cereals from industrial regions was higher than those from regions far away from industry. In 1972/73, the content of 3,4-benzpyrene in wheat grown close to industry was 0.29 micrograms/kg and 1.12 micrograms/kg in barley; in wheat and barley from far-away-regions, the values were 0.15 and 0.30 micrograms/kg respectively. The differences between the two regions were smaller in Hungary than in the Federal Republic of Germany.

51079 **APTIC NO. 70741**

Takita, T. and E. Kitada

ON THE DAMAGE OF AGRICULTURAL CROPS DUE TO PHOTOCHEMICAL SMOGS IN YOKOHAMA CITY. *(Yokohama shi ni okeru kokagaku smmogu niyoru nosakumotsu higai chosa ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):362, Nov. 1974.*

A field survey of crop damage was carried out April-Oct. 1973 on crops grown in 30 places in Yokohama City. Of the 2514 investigated plants, the damage due to photochemical smog was recognized on 247 plants including 50 species and varieties. When the degree of damage was compared to that in 1972, the ratio of damage occurrence to number of investigations increased from 12/15 to 12/12, and the number of plants damaged increased from 157 to 247. The cause was the more frequent occurrence of photochemical smogs in 1973. The area of damage occurrence was also broader in 1973. Specially severe damage to spinach in Totsuka Ward on Sept. 25 was caused by photochemical smog with a 1-hour average oxidant concentration of 0.12 ppm.

51080 **APTIC NO. 70776**

Takizawa, H.

LOCAL ENVIRONMENTAL CONTROL AND BIOLOGICAL INDICATOR - AIR POLLUTION AND BIOLOGICAL INDICATOR. *(Chiiki no kankyo kanri to seibutsu shihyo - taiki osen to seibutsu shihyo-). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 3(11): 803-812, Nov. 1974.*

Two sides of environmental control, the feed forward control and the system of environmental control utilizing feedback, are described with relation to biological indicators. As one of the factors in terrestrial ecological systems, the concentration of air pollutants was related to plant damage, referring to a result of a survey on the frequency of damaged plant (cryptomeria) versus concentration of sulfur dioxide, for several distances from the coast. The merits and the selection standards of a biological indicator are described in detail citing specified plant indicators to respective air pollutants such as SO2, hydrogen fluoride, nitrogen dioxide, ozone, peroxyacetyl nitrate, ethylene, chlorine, hydrogen chloride, ammonia, and photochemical oxidants. As general biological indicators, some insects, some amphibians, fishes, birds, mammals including mankind, and plants, can be used. In utilizing plants as an indicator of air pollution, the detailed standard items which represents the active status of the indicator plants were described.

51081 **APTIC NO. 70354**

Taniyama, T. and T. Watanabe

SYMPTOMS AND SUSCEPTIBILITY OF PLANTS TO GASEOUS CHLORINE. *(Enso gasu ni yoru shokubutsu no higai shojo to sono kanjusei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(2):372, Nov. 1974.*

Symptoms of plants due to chlorine injury were divided into the following five groups: chlorosis or white to greyish- white discoloration on the apex or periphery of leaves of rice, wheat, and Alopecules; and reddish brown discoloration of the apex and iterveinal parts and leaf-fall in rice, Cryptotaenia, and Zelkova. The reddish brown spots on rice leaves are due to aqueous hydrochloric acid formed from chlorine and water droplets in air. The third group is brown black or black discoloration on the leaf periphery or interveinal parts of French bean. The last category is leaf-fall of seemingly uninjured leaves of cherry, Acer, and Xanthoxylum. The rate of appearance of injuries differed from plant to plant, 7-10 days in Acer and pines, and three days in French bean, rice, Allium, and Paeonia moutan.

51082 **APTIC NO. 70752**

Vasiloff, G. N. and M. L. Smith

A PHOTOCOPY TECHNIQUE TO EVALUATE FLUORIDE INJURY ON GLADIOLUS IN ONTARIO. *Plant Disease Reptr., 58(12):1091-1094, Dec. 1974. 4 refs.*

A photocopy method was used for evaluating and reproducing fluoride-induced leaf injury during a gladiolus indicator plant program. Measurements of leaf injury and fluoride content were made on 5000 leaves from potted gladioli plants grown at 31 indicator plot locations in seven surveillance areas located in the Province of Ontario. Harvested plants were transported to a laboratory where a standard office photocopier was used to make reproductions of four middle-aged leaves from each plant. All leaves collected from each plot were divided into terminal and basal portions for chemical analysis of fluoride and other phytotoxic components. Comparisons of fluoride content and leaf injury for three collections of gladioli in a surveillance area near a fertilizer plant showed reductions in leaf injury which paralleled reductions in fluoride content for increasing distances downwind of the source. As the plot distance increased from 3.4 km to 5.5 km from the source, fluoride content decreased from 5.0 ppm to 3.0 ppm and leaf injury decreased from 4.6% to 0.2%.

51083 **APTIC NO. 73122**

Wallace, Gordon and S. R. Koirtyohann

THE ANALYSIS OF TRACE METALS IN SUB-MILLIGRAM QUANTITIES OF BIOLOGICAL MATERIAL BY FLAMELESS ATOMIC ABSORPTION. *Missouri Univ., Columbia, Environmental Trace Substances Center and National Science Foundation, Washington, D. C., RANN Program, Trace Subst. Environ. Health Proc., Annu. Conf., 8th, Columbia, Mo., 1974, p. 239-242. 10 refs. (June 11-13.)*

A flameless atomic absorption spectrometric method for the sub-milligram multielement analysis of various trace metals in Drosophila (fruit flies) is described. A single Drosophila is dried, weighed, and ashed with small volumes of nitric acid and hydrogen peroxide in a quartz tube. The inorganic residue is taken up on 200 microliters of dilute nitric acid; 5-20 microliter aliquots are used for the atomic absorption determinations. The use of an electrically-heated graphite tube furnace permits the use of samples sufficiently small to eliminate background absorption and matrix interference problems frequently seen in furnace atomic absorption. Levels down to 0.2, 2.0, 4.0, 1.0, and 2.0 micrograms/g for cadmium, lead, copper, manganese, and iron, respectively, can be detected in a single fly dissolved in 200 microliters of solution, if 5 microliter aliquots are taken. Lower levels can be detected if larger aliquots are taken. Lead and cadmium are of interest because Drosophila can be used to monitor environmental contaminants while copper, manganese, and iron concentrations are affected by such contaminants. (Author abstract modified)

51084 **APTIC NO. 70616**

Wood, Tim and F. H. Bormann

THE EFFECTS OF AN ARTIFICIAL ACID MIST UPON THE GROWTH OF BETULA ALLEGANIENSIS BRITT. *Environ. Pollut., 7(4):259-268, Dec. 1974. 14 refs.*

Yellow birch seedlings (Betula alleghaniensis) were exposed to artificial acid mists ranging in pH from 4.7 to 2.3 for periods up to 15 weeks to investigate effects of precipitation pH on plant growth and development. Foliar tissue damage (necrosis) and abnormal morphogenesis of leaves were observed for 6-week-old seedlings subsequently subjected for 11 weeks to intermittent spraying with mists at pHs of 3.0 and 2.3. Younger (2-week-old) seedlings were more sensitive to acid mist treatment, suggesting that rapidly dividing cells are more susceptible to injury. Mist acidity did not have a significant effect on total plant weight, total leaf weight, or stem length at pHs of 3.0 and above (the natural range of precipitation acidity in the northeastern United States). Only when the mist pH was lowered to 2.3 was the growth of 6-week-old seedlings markedly reduced after 11 weeks of treatment. Although plant growth at pH 3.0 was not significantly decreased, leaf damage was observed, suggesting that reduced growth may ultimately occur with longer periods of acid misting. Continued investigation of acid rain effects and field examinations of foliar tissue are critical since acid rains averaging about pH 4.0 and ranging as low as pH 3.0 have been falling on New Hampshire forests for at least the last 8 yr. (Author summary modified)

51085 **APTIC NO. 70532**

Kanagawa Prefecture (Japan), Section on Pests and Agricultural Crop Diseases

INVESTIGATION OF LOCAL EVALUATION OF THE EFFECTS OF AIR POLLUTION BY BIOLOGICAL INDICATOR. PART I: ACTUAL STATE INVESTIGATION OF LOCAL CHANGE OF INSECT DISTRIBUTION. *(Seibutsu shihyo ni yoru taiki osen eikyo no chiiki hyoka ni kansuru chosa kenkyu). Text in Japanese. Kanagawa-ken Nogyo Sogo Kenkyujo Gyomu Nenpo (Ann. Rep. Kanagawa Prefect. Agr. Integr. Inst.), 1973:59-60, June 1974.*

The number and the species of moths collected by light traps installed over the Kanagawa area were used to calculate the diversity indices for evaluating the state of moth distribution. The diversity indices were the highest in mountainous areas, next highest in suburbs of moderately sized cities, and lowest in the central part of a large city such as Yokohama, suggesting that as the development progresses, the state of insect distribution becomes simpler.

51086 **APTIC NO. 70775**

Karatsu City Govt. Members of Higashi-matsuura Agr. Improvement and Popularization Station

THE DAMAGE OF CITRUS FRUIT DUE TO AIR POLLUTION IN KARATSU CITY. *(Karatsu-shi ni okeru mikan higai). Text in Japanese. Kogai no Genkyo to Taisaku(Sagaken Kosei-bu) (Status Quo Mea. Environ. Pollut. Saga Prefect.), 1974:92, July 1974.*

The damages of fruits of Citrus unshu appearing as black spots on fruit surface occurred both in 1972 and 1973 in orchards around Hoshiyama in Karatsu City, Saga Prefecture. The damaged area was 65.5 ha and 105.3 ha with nontable fruits of 348 t and 1105 t, respectively, in 1972 and 1973. The damage began to appear after a flower-fall early in June on the leaves and on the young fruits in 1973. The cause of the damage was presumed to be the smoke and dust exhaust from the Karatsu Thermal Power Station. A strict regulation would be promulgated on sulfur oxides and dusts from the station. Experiments in the test field will be begun with cooperation of the station, the fruit experiment station, Saga Univ. and Agriculture Cooperation Federation.

1973

51087 **APTIC NO. 73172**

Berge, H.

SULFUR DIOXIDE AND HYDROGEN FLUORIDE EMISSIONS IN REGARD TO PHYTOPATHOLOGY. *(SO-2-und HF-Immissionen im Blickpunkt der Phytopathologie). Text in German. Meded. Fac. Landbouwwet., Rijksuniv. Gent, 38(3/2):1545-1548, 1973. 2 refs.*

Observations of the effects of sulfur dioxide and hydrogen fluoride on forest trees and their parasites are presented. Abies concolor and Abies veitchi in a smoke damaged area were attacked by Dreyfusia nuesslini most intensely in areas where 2- and 3-year-old needles had already been damaged by SO2 and HF. The attack of Phytomyza ilicis in Ilex was more intense in undamaged specimens than in those exposed acutely to high SO2 concentrations. The spread of Oligonychus ununguis in Picea amorika facilitated the manifestation of SO2-induced damages in yet undamaged 2- and 3-year-old needles.

The invasion of areas sheltered from SO2 by Sacchiphantes viridis indicates the susceptibility of this species to SO2. This parasite species did not occur in SO2-damaged areas which were occasionally exposed to sodium fluoride- and arsenic-containing dusts. The considerable damages afflicted by Blastethia turionella to Pinus montana in areas with high SO2 concentrations indicate the high resistance of this species.

51088 **APTIC NO. 73169**

Delcarte, E., P. Nangniot, and R. Impens

DETERMINATION OF METALLIC ELEMENTS IN SOILS AND PLANTS IN INDUSTRIAL AND URBAN SITES. *(La determination d elements metalliques dans les sols et les vegetaux, en sites industriels et urbains). Text in French. Ann. Gembloux, 79(2):141-149, 1973. 4 refs.*

The first phase of a program to study metals in soils and plants in industrial and urban sites is reported. The metals analyzed were copper, cobalt, nickel, zinc, lead, and cadmium. The soil samples were taken at increasing distances from potential emission sources with respect to dominant wind directions. Ubiquitous plants, such as Tussilago farfara L., Plantago major L., Mercurialis annua L., and Agrostis velgaris With. were used as samples for differential oscillopolarographic analyses. Soil samples taken around a zinc ore roasting plant showed very high zinc contents, and irregular distribution of cadmium and copper. Plant samples taken at different distances from the plant revealed rapid reduction of the copper, zinc, and cadmium levels with increasing distance. Very high concentrations of copper were found in plants around a petroleum refinery. Leaves of Acer platanoides var. Schwedlerii in a town contained an average of 14.1 ppm copper, 0.7 ppm cobalt, 5.4 ppm nickel, 160 ppm zinc, 145 ppm lead, and 0.08 ppm cadmium, relative to the dry weight. The findings indicate that samples should be obtained over a period of sufficient length.

51089 **APTIC NO. 73476**

Impens, R., R. Paul, and M. Thunis

TEST OF ARTIFICIAL FUMIGATION OF PLANTS. *(Les essais de fumigation artificielle de vegetaux). Text in French. Ann. Gembloux, 79(1):25-35, 1973. 6 refs.*

The effect of sulfur dioxide on Phaseolus vulgaris, Nicotianum tabacum, Zea mais, and Beta vulgaris was studied in artificial fumigation tests under light conditions and with different exposure times. The SO2 concentrations were varied between 0.5 and 5 mg/cu m. Young Phaseolus vulgaris plants exposed to SO2 during the initial period of light exposure showed an increased photosynthetic activity followed immediately by partial inhibition of the photosynthesis. Plants exposed to SO2 at the end of the light exposure were in the phase of inhibited photosynthesis. Leaf necroses appeared in Phaseolus vulgaris plants after 6-day-exposure to 1.2 mg/cu m SO2, while exposure to 3.5 mg/cu m afflicted the same degree of damage in 24 hours. Loss of turgidity of the leaf stalks and plasmolysis in the parenchymatous cell vacuoles of the mesophyllum were identified as the precursors of necrosis. Older plant leaves showed a greater harmful effect from the exposure to SO2 than did younger plant leave .

51090 **APTIC NO. 72986**

Murtha, Peter A.

SO2 DAMAGE TO FORESTS RECORDED BY ERTS-1. *National Aeronautics and Space Administration, Washington, D. C., Goddard Space Flight Center, (Earth Resour. Technol. Sattell.-1, 3rd Symp. Proc., Washington, D. C., 1973), p. 137-143. 4 refs. (Dec. 10-14, Paper A9.)*

Satellite imaging (ERTS-1) was used during four successive passes to detect sulfur dioxide-induced forest damage around Wawa, Ontario. Image interpretation supported by electron color enhancement was used to dilineate three damage zones (total-kill, heavy-kill, and medium-damage). The results from the satellite mapping technique were similar to results obtained from aerial sketching and air photo interpretation. Band 5 provided the greatest detail for assessing forest damage, followed in successive order by bands 4, 6, and 7. Although total kill was separated from heavy-kill damage zones, total-kill was not consistently separated from clear-cut logging, burned areas, and frozen lakes and bogs. Nevertheless, the imagery technique appears to provide a simple means of mapping and monitoring large forest areas affected by severe SO2 fume damage, provided sufficient time elapses for the damaged forest region to take on the characteristics of air pollution damage. The mapping of light injury areas from satellite imagery does not appear possible.

51091 **APTIC NO. 70491**

Odaira, Toshio

STUDIES ON PHOTOCHEMICAL SMOG PHENOMENA AND ITS EFFECTS ON PLANT DAMAGE IN TOKYO. *(Tokyo ni okeru kokagaku hannou ni yoru taikiosen gensho oyobi shokubutsu higai ni tsuite). Text in Japanese. Minzoku Eisei (Human Hyg.), 39(5):118-145, Sept. 1973. 56 refs.*

The specific features of Tokyo photochemical smog, which differs from Los Angeles smog, are discussed. The plant damage due to Tokyo photochemical smogs, which have hitherto been reported several times elsewhere, were divided into species using the experimental results from exposing plants to artifically controlled conditions of air pollutants. Primary and secondary pollutant concentrations in Tokyo and Los Angeles are compared. Emergency smog warnings in Japan and Tokyo are described. Human injuries caused by photochemical smog, the relationship of weather and oxidant concentrations, and the behavior of pollutants in the atmosphere above Tokyo are also described.

51092 **APTIC NO. 73469**

Willam, A. and P. Heinemann

FIXATION OF ATMOSPHERIC DUSTS BY PLANTS. *(Fixation des poussieres atmospheriques par les vegetaux). Text in French. Ann. Gembloux, 79(1):11-24, 1973.*

Results of dustfall measurements by a deposit gauge, and of measurements of dust retention by grass and trees are presented. The dustfall values obtained at different sites range from 192 to 825 g/100 sq m, with the water-insoluble fraction ranging from 102 to 597 g/100 sq m. The chloride and sulfate ion concentrations as well as the calcia content were in the respective ranges of 14-39; 18-47, and 18-36 g/100 sq m. Both grass and trees were found to retain large proportions of atmospheric dust. A linden tree with 1000 sq m leaf surface and occupying 50 sq m was found to retain 1.6 g of dust per sq m, while a birch tree occupying 15 sq m eliminates 0.5 g of dust per sq m.

1972

51093 **APTIC NO. 69966**

Daessler, H. -G., H. Ranft, and K. -H. Rehn

THE SUSCEPTIBILITY OF WOODY PLANTS EXPOSED TO FLUORINE COMPOUNDS AND SO2. *(Zur Widerstandsfaehigkeit von Gehoelzen gegenueber Fluorverbindungen und Schwefeldioxid). Text in German. Flora (Jena), vol. 161:289-302, 1972. 11 refs.*

The results of fume hardiness tests carried out with several woody plant species in cabin trials and in field tests around a major fluorine emission source with regard to resistance against sulfur dioxide and fluorine compounds are presented. Most of the woody plants were found to respond to both pollutants in a a similar way regarding leaf damage and both the time of occurrence of the first injuries and the extent of the damage. Similarly to SO2-damaged leaves, fluorine-damaged leaves showed apical and edge necroses, while intercostal necroses were prevalent in SO2-exposed leaves. Needles are more sensitive to fluorine than to SO2 in the spring. Juglans regia, Vitis vinifera, Pinus sylvestris, Berberis vulgaris, Picea abies, and Larix decidua were found to be most sensitive to fluorine, while Taxus baccata, Tilia cordata, Alnus incata, Salix elaegnus, Carpinus betulus, Pinus strobus, Pinus nigra austr., Potentilla fruticosa arb., Castanea sativa, Lonicera tatarica, and Picea pungens were less susceptible. Pinus montana, P. contorta, Cornus alba sib., Prunus cerasifera Piss., Ulmus campestre, Alnus glutinosa, Pinus peuce, Robinia pseudoacacia, Fagus silvaticus, Fraxinus excelsior, Salix aquatica and fragilis, Malus eleyi, Platanus acerifolia, Quercus borealis, and Prunus serotina were characterized by a medium degree of resistance. Viburnum lantana, Rosa species and cultivars, Syringa vulgaris, and especially Acer platanoides and campestre, Evonymus europaea, Philadelphus coronarius, Quercus robur, and Sambucus racemosa were resistant to fluorine. Castanea sativa, Juglans regia, Rhododendron japonicum Taxus baccata, Vitis vinifera, Buxus sempervirens, Lonicera tatarica, Picea pungens, and Platanus acerifolia were more resistant to fluorine than to SO2, while Lycium halimifolium, Forsythia intermedia, Philadephus coronarius, and Pyracantha coccinea were more susceptible to SO2 than they were to fluorine.

1955

51094 **APTIC NO. 70215**

Hupka, E.

ABOUT FLY-ASHES-POISONING IN THE SURROUNDINGS OF FOUNDRIES. *(Ueber Flugstaubvergiftungen in der Umgebung von Metallhuetten). Text in German. Wien. Teiraerztl. Monatsschr., vol. 42:763-775, 1955. 6 refs.*

Chronic articular swellings were observed in colts and cattle grazing in the vicinity of two factories. Postmorten findings included an increased synovial content and a detachment of articular cartilage from the underlying bone. Several of the colts also developed roaring due to paralysis of the recurrent nerves. Analysis of fly-ash samples from the two foundries revealed the following: lead, 16.87% and 44.79%; zinc, 23.41% and 5.28%; sulfur, 12.53% and 8.20%; and arsenic, 0.52% and 0.22%, respectively. Cadmium levels of 2.22% were also found in the dust from one of foundries, while cerium (5.00%) was detected in the dust from the other foundry. Identical articular lesions were reproduceded in two colts receiving dietary rations containing the forge dusts. Manifestations of pharyngoparalysis also appeared, resulting in pneumonia in one cae due to pharyngeal dysphagia. Lead poisoning, complicated by other toxic substances, was suggested as the cause. Analyses of several colt livers revealed contents exceeding 0.2 mg/100 g in all cases.

EFFECTS-MATERIALS

1975

51095 **APTIC NO. 70380**

Ergang, R. and M. B. Rockel

CORROSION RESISTANCE OF STAINLESS STEELS AT THE ATMOSPHERE - EVALUATION OF THE RESULTS OF WEATHERING TESTS UP TO 10 YEARS DURATION. *(Die Korrosionsbestaendigkeit der nichtrostenden Staehle an der Atmosphaere - Auswertung von Versuchen bis zu 10 jaehriger Auslagerung). Text in German. Werkstoffe Korrosion, 26(1):36-41, 1975. 8 refs.*

The evaluation of results obtained in the course of weathering tests of up to 10 yr duration has confirmed the conclusions drawn after 1 yr of exposure. A chromium-nickel-molybdenum steel (Werkstoff No. 1.4401) can be used even in the most severe conditions; slight corrosions found in marine atmospheres can be attributed to unpolished surfaces. The 17% chromium steel is considerably attacked in industrial and marine atmospheres and should not be used for the external parts of buildings. The 18/8 steels are perfectly resistant to urban atmospheres, with the exception of those portions which are not exposed to the cleansing effect of rain waters. In all the cases studied the corrosion resistance of the steels has been improved by electropolishing. Electrochemical studies have further revealed that the pitting corrosion susceptibility decreases in the same order as the atmospheric corrosion resistance.

EFFECTS-ECONOMIC

1975

51096 **APTIC NO. 73001**

Ponder, Thomas C., Jr. and Lario V. Yerino

CAPITAL COSTS OF SULFUR DIOXIDE CONTROL SYSTEMS FOR UTILITY BOILERS. *Preprint, American Society of Mechanical Engineers, New York, 21p., 1975. (Presented at the American Society of Mechanical Engineers, Air Pollution Division, National Symposium, 4th, St. Louis, Mo., March 24-25, 1975.)*

Capital costs of limestone versus Wellman-Lord flue gas desulfurization are estimated for a single 500 MW boiler plant burning either 1% or 3.5% sulfur coal. The limestone system runs $60 and $71/KW for low and high sulfur coal, respectively, as compared to $69 and $104/KW for the Wellman-Lord system. Thus, the impact of sulfur content on capital cost is much less for the limestone system. The addition of particulate control requires about the same capital cost for each system (approximately $20/KW). Retrofit costs are higher for the Wellman-Lord system, being $25 and $26/KW for low and high sulfur coal as compared to $18 and $19/KW for the limestone system. Redundancy costs which include expenses for system overdesign or an extra absorber train to gain added reliability are about the same for each system, being approximately $42/KW. Capital and annualized costs for other SO2 emission control alternatives are compared with flue gas desulfurization which falls into the middle of the cost picture.

51097 **APTIC NO. 70332**

Usui, Hisashi

PRESENT STATUS AND TREND IN POLLUTION CONTROLLING INDUSTRIES. *(Kogai boshi sangyo no genjo to doko). Text in Japanese. Puranto Enjinia (Plant Eng.), 7(1):26-30, Jan. 1975.*

The term pollution control industry refers to industries engaged in the production of pollution control devices. The general status and trends in production systems, technical development, and distribution systems are discussed. The total number of companies producing pollution control devices exceeds 1000, and the resulting excessive competition and makers of poor products indicates the need for a consensus system within the industry. The most urgent task in the field of technical development is the development of suitable materials such as metallic material with high corrosion resistance and thermal stability which can withstand severe conditions under which the pollution control devices are used. In the distribution system, the emphasis is placed on the establishment of proper procedures for service and maintenance. The market trend is analyzed and discussed in terms of gross production, ratio by types of control devices, yearly growth rate in gross production, and yearly investment in the pollution control device industry. The ratio of product exported is extremely small, though it is increasing yearly. This is probably the reflection of the urgent demand in the domestic market.

1974

51098 **APTIC NO. 70620**

Lalor, William G., Jr.

CLEAN AIR. *EEI Bull., 42(5):227-232, Sept./Oct. 1974.*

The costs of complying with the Clean Air Act of 1970 for electric utility companies are discussed, and alternatives are proposed. The national cost for controlling sulfur oxides in compliance with the Clean Air Act would be $10 billion/yr. Costs for individual companies would go up by 1/3, while the consumer s cost would increase by 75%. There is no clear relationship between people s health and sulfur oxide levels at ambient air quality limits or at twice those limits. House of Representative bill 13454 was introduced to amend the Clean Air Act so that alternative nonuniform means could be used to meet ambient air quality standards. The bill would: define the words protect and enhance; encourage air quality control measures that consider total environmental, economic, and social impacts; allow alternates to uniform emission limitations; and provide for revision of state plans if more cost-effective methods of meeting air quality standard s become available. A procedure is provided by which the operator of a stationary source could apply for a particular emission limit for an individual plant. The plant operator would have to show that he would meet and maintain ambient air quality standards.

51099 **APTIC NO. 73018**

American Petroleum Inst., New York, Div. of Public Affairs

ENVIRONMENTAL EXPENDITURES OF THE UNITED STATES PETROLEUM INDUSTRY 1966-1973. *Publ. 4233, 20p., 1974 (?).*

Environmental protection expenditures of the petroleum industry within the United States are reported. Companies report environmental expenditures for the period of 1966 through 1973 totalling $5.5 billion. The total expenditures for air in this period was $2888 million, of which $1739 million was for capital; $746 million for operating and maintenance; $162 million for administrative purposes; and $241 million for research and development. In 1973, the largest expenditures were required for air quality. These were equivalent to 59.5% of the expenditures reported.

1973

51100 **APTIC NO. 69945**

Nijkamp, P. and J. H. P. Paelinck

AN INTERREGIONAL MODEL OF ENVIRONMENTAL CHOICE. *Reg. Sci. Assoc. Pap., vol. 31:51-71, 1973. 9 refs. (Presented at the Regional Science Association, European Congress, 12th, Rotterdam, Netherlands, 1972.)*

An operational approach is presented for interregional environmental problems. The operational framework incorporates basic economic factors such as profitability and employment conditions, final demand, environmental requirements, allocation systems, and transportation costs. The model allows one to analyze and evaluate the consequences of pollution abatement schemes and changes in the activity structure (for instance, input substitution, alternative production processes, recycling operations). In this way, environmental quality management agencies are provided with a set of analytical guidelines in their search for a new interregional equilibrium. The model as such is a static model. It does not describe the way in which a new situation can be reached. However, a comparison of the new optimal structure with the existing structure indicates the measures required for the attainment of a desired environmental quality. While every member of society contributes to environmental deterioration, no one person is uniquely responsible. Therefore, environmental quality control is a much broader responsibility than can be encompassed by public agencies, though the latter possess a set of appropriate instruments and corrective actions for arriving at the optimum outcome of the interregional program. The actions and instruments to be implemented by public agencies may be of a varied nature. They may include licenses, compulsory standards, charges, and subsidies on recycling operations. In addition, the stock of natural capital can be considerably enlarged by public investments in the environmental sector. (Author conclusions modified)

51101 **APTIC NO. 68938**

Polinsky, A. Mitchell and Steven Shavell

AMENITIES AND PROPERTY VALUES IN A GENERAL EQUILIBRIUM MODEL OF AN URBAN AREA. *Urban Inst., Washington, D. C., Rept. 1207-5, 26p., July 1973. 26 refs.*

A model of residential location and land rent determination is presented for use in studying the dependence of property values on a schedule of amenities (such as air and noise pollution) in two limiting cases. In one case, there is perfect household mobility among and within cities; in the second case there is mobility only within cities. The affects of the amenities at a particular location on the property value of that location, the possibilites of predicting a new property value schedule resulting from a change in the amenity schedule, whether the change in the aggregate property values corresponds to some notion of willingness to pay, and whether a single equilibrium property value schedule can be used to derive the implicit demand for amenities, are discussed and examined. (Author abstract modified)

STANDARDS AND CRITERIA

1975

51102 **APTIC NO. 70553**

Megonnell, William H.

ATMOSPHERIC SULFUR DIOXIDE IN THE UNITED STATES: CAN THE STANDARDS BE JUSTIFIED OR AFFORDED? *J. Air Pollution Control Assoc., 25(1):9-15, Jan. 1975. 27 refs.*

It is generally acknowledged that the data base was insufficient for quantifiable, scientific definition of clean air when the national ambient air quality standards were adopted by the Environmental Protection Agency in 1971, and little pertinent knowledge has been added since then. However, recent reviews have concluded that there is no basis for changing the standards, which were set to protect health with an adequate margin of safety and to protect welfare from known and anticipated adverse effects. Examination of the latest available ambient air quality data shows that the U. S. does not have a national sulfur dioxide problem. Official reports list a few areas where the national standards are being exceeded, but close scrutiny of data gathered by a variety of inaccurate monitoring techniques reveals that such conclusions are suspect in many areas. Inadvertently or intentionally, official pronouncements and public statements regarding health endangerment from SO2 are often distorted or inaccurate. Misunderstanding or misuse of the jargonistic terms emission limitations and ambient standards may be responsible in large part for confusion and unfounded concern. Recent epidemiological evidence suggests that no demonstrable health benefit has accrued as the result of dramatic reduction of sulfur dioxide concentrations in New York City. New theories regarding secondary pollutants are emerging. Solid evidence on most aspects of these hypotheses is seriously lacking, however, and it would ve premature to base control action on such speculation. Considerable study will be necessary if costly mistakes are to be avoided in formulating future control schemes. (Author summary modified)

51103 **APTIC NO. 73459**

O Connor, John R., Williams F. Hamilton, and Allen C. Basala

COST CONSIDERATIONS IN ESTABLISHING AIR POLLUTION PERFORMANCE STANDARDS FOR STATIONARY SOURCES. *Preprint, American Inst. of Chemical Engineers, New York, 20p., 1975. 1 ref. (Presented at the American Institute of Chemical Engineers, National Meeting, 79th and 8th Petrochemical and Refining Exposition, Houston, Tex., March 16-20, 1975.)*

Cost considerations involved in the establishment of air pollution performance standards for stationary sources are reviewed. The main criterion for economic reasonability is the impact of the standard on growth of the industry affected. Factors analyzed in determining the reasonability of a standard include such items as industry structure, projected future supply and demand levels, industry concentration and integration, net imports or exports, product price history, price elasticities, the level of control at existing facilties, industry profitability, and competing products or processes. The costs considered under Section 111 of the Clean Air Act include those incremental capital and annualized operating costs incurred by the owner of the controlled facility for any level of control in excess of the level required by an average state regulation. A cost-benefit analysis is not performed at the time that a performance standard is developed for criteria pollutants. Future analyses of alternative standards for designated pollutants will, however, consider health and welfare benefits at alternative control levels. (Author summary modified)

51104 **APTIC NO. 70753**

Quarles, John

LOW-EMISSION VEHICLE CERTIFICATION BOARD. DETERMINATION REGARDING SUITABILITY OF PURCHASE BY FEDERAL GOVERNMENT. *Federal Register, 40(26):5562, Feb. 6, 1975.*

The Low Emission Vehicle Certification Board determined that six battery-powered vehicles qualifying as low-emission vehicles under section 212(c) of the Clean Air Act were not suitable substitutes for any vehicles presently being purchased by the Federal government in accordance with criteria specified in section 212(d) of the Clean Air Act. The vehicles were rejected as substitutes for existing vehicles covered by the General Services Administration procurement specifications since they did not meet performance requirements in terms of acceleration, high- speed passing, maximum sustained velocity, and maximum range. The vehicles were submitted for certification under section 212 of the Clean Air Act by the Battronic Truck Corporation Division of the Boyertown Auto Body Works.

1974

51105 **APTIC NO. 70337**

Baum, Fritz

MEASURES FOR THE REDUCTION OF EMISSIONS FROM WOOD-FIRED FURNACES. *(Massnahmen zur Verminderung der Emissionen von Holzfeuerungen). Text in German. Gesundh.-Ingr., 95(12):362- 363, 1974.*

In its first ordinance concerning execution of the Federal Immission Protection Act, the Federal Republic of Germany limited the emissions from small and large firing systems for solid fuels. Small firing systems up to 80,000 kilojoule/hr (19,000 kcal/hr) must be fired with dry wood to reduce smoke emission. For large firing systems above 80,000 kilojoule/hr, limit concentrations for dust, soot, and tar refer to a carbon dioxide concentration of 12 vol % in the waste gas. For manually charged firing systems the limits are 150 mg/cu m and for mechanically charged systems they are 300 mg/cu m.

51106 **APTIC NO. 70166**

Hannum, A. K.

EMISSION STANDARDS, VEHICLES IN USE AND THE AUTOMOTIVE AFTERMARKET. *State and Territorial Pollution Program Administrators, North Amer. Motor Vehicle Emission Contr. Conf., Annu., 3rd, Proc., San Antonio, Tex., 1974, p. 401-420. (Sept. 25-27.)*

Features of the 1970 Clean Air Act are considered in terms of emission warranty provisions of the Act and replacement parts related to maintaining the emission warranty of a vehicle. The Environmental Protection Agency and the replacement parts industry are jointly investigating the following elements relative to aftermarket parts certification: the determination of what automotive replacement systems and/or parts merit regulation insofar as air pollution is concerned; the development by industry of industrial standards for such parts subject to EPA approval; administrative procedures to permit optional, voluntary certification by a manufacturer of his product against such standards and the right to sell it as a certified article; an administrative procedure for EPA surveillance and possible decertification and recall of offending parts; and interpretation of certified parts as equivalent in terms of vehicle emissions warranty and maintenance instructions. The EPA plans to publish in the Federal Register a set of proposed guidelines for aftermarket parts certification.

51107 **APTIC NO. 70790**

Kirk, Alan G., II

SUSPENSION OF 1977 AUTOMOBILE EMISSION STANDARDS. GUIDELINES FOR APPLICATIONS FOR SUSPENSION OF 1977 HC AND CO EMISSION STANDARDS. *Federal Register, 39(233):41899-41902, Dec. 3, 1974.*

Guidelines for applications by automobile manufacturers for suspension of 1977 hydrocarbons and carbon monoxide emission standards are presented. The guidelines indicate what is required of manufacturers in establishing the four criteria which must be satisfied before a suspension is allowed. A suspension can be granted if it is determined: the suspension is essential to the public interest or the public health and welfare of the United States; all good faith efforts were made to meet the established standards; the applicant established that effective control technology, processes, operating methods, or other alternatives are not available or have not been available for a sufficient period of time to achieve compliance prior to the effective date of such standards; and the study and investigation of the National Academy of Sciences and other information available to him has not indicated that technology, processes, or other alternatives are available to meet such standards.

51108 **APTIC NO. 70639**

Oshio, Toshiki

AIR POLLUTION AND THE TOTAL EMISSION CONTROL REGULATIONS. *(I) (Taiki osen to soryo kisei (I)). Text in Japanese. Kako Gijutsu (Process. Tech.), 9(6):2-4 and 11, 1974.*

The status of air pollution in Osaka is reviewed. With 57,200 manufacturing factories and a total of 356,536 business establishments, a huge amount of air pollutants is emitted constantly. The amount of fuel consumption, which is the major contributing source of pollution in 1970, was 11,710,000 kl for heavy oil, 690,000 kl for gasoline, and 840,000 kl for light oil. The total emission quantity for sulfur oxides, nitrogen oxides, particulate matter, hydrocarbons, and carbon monoxide are given, and their average concentrations are compared to their environmental standards. The SOx concentration increased steadily from 1955, reaching 0.21 ppm in 1964. Since the enforcement of the K value regulation, the SOx concentration has decreased from 0.056 ppm in 1970 to 0.035 ppm in 1972, in spite of the increase in fuel consumption. The sulfur content in crude oil was reduced from 2.04% in 1965 to 1.58% in 1970;

and S content in heavy oil was reduced from 2.6% in 1966 to 1.9% on 1970. The settling particulate concentration was decreased from 13.3 tons in 1968 to 8.8 tons in 1972 due to the fuel conversion from coal to heavy oil. On the other hand, the suspended particulate concentration, is approximately eight times higher than the environmental standard, and control by various means such as the use of dust collectors and fuel conversion to gas fuel is urgently needed. As for the NOx concentration, the data obtained at 20 measuring stations in 1972 are given. The NOx concentration is 5 to 15 times higher than the environmental standard. The control measures have been taken by means of two-stage combustion, exhaust gas recirculation, and cold air methods; however, further technical developments, such as the denitration process, are needed to meet the environmental standard.

51109 **APTIC NO. 73081**

Rubin, E. S. and F. C. McMichael

SOME IMPLICATIONS OF ENVIRONMENTAL REGULATORY ACTIVITES ON COAL CONVERSION PROCESSES. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 69-90. Oct. 1974. 34 refs.*

Existing United States environmental regulatory policies for air and water pollution control are reviewed in relation to their potential implications on coal conversion processes presently under development in this country. The air pollutants from coal conversion processes include: sulfur dioxide, nitrogen oxides, particulates, hydrocarbons, carbon monoxide, sulfur, oxides, ammonia, hydrogen cyanide, and trace elements. Regulation of these and other air pollutants is based on Ambient Air Quality Standards including: National Primary Standards, National Secondary Standards, Non-degradation Standards, and state and local standards; emission standards including: new source performance standards, hazardous pollutants, and state and local standards; and threshold limit values. The interactive roles of Federal, state, and local authorities in defining and implementing environmental control programs are discussed. Elements of existing regulatory activities are shown to impose potentially conflicting or inconsistent requirements that may be counterproductive to environmental quality. (Author abstract modified)

51110 **APTIC NO. 70528**

Japan Environmental Agency, Div. of Air Pollution Control

EXPLANATORY DATA ON AUTO EXHAUST GAS STANDARD IN 1975. *(Jidosha haigasu showa 50 nendo kisei setsumei shiryo). 11p., Jan. 1974.*

Explanatory information on the 1975 automotive emission control standard is given. The existing 10-mode method and new 11-mode method which includes the emissions in the cold starting period are described for the measurement of carbon monoxide, hydrocarbons, and nitrogen oxide concentrations in exhaust gas. The existing emission standard and the 1975 emission control standard were compared, and the reduction rates by the 1975 standard were calculated to be 89% CO, 91% HC, and 45% NOx for passenger cars, and 29% CO, 28% HC, and 17% NOx for light weight buses and trucks. The automotive exhaust gas emission control techniques suitable for achieving the 1975 emission control standard are summarized.

51111 **APTIC NO. 73011**

Dept. of Commerce, Washington, D. C., Environmental Affairs Div.

IMPLICATIONS OF AIR NON-DEGRADATION POLICIES ON CLEAN AIR REGIONS: A CASE STUDY OF THE DALLAS-FORT WORTH AQCR (215). *68p., May 1974. 2 refs.*

NTIS: COM-74-11438

Baseline and potential air pollution (sulfur dioxide and particulates) from industrial and area source emissions in the Dallas-Fort Worth Air Quality Control Region are examined in terms of projected growth patterns and proposed alternative nondegradation air quality criteria. Baseline 1972 SO2 concentrations in the area are well below the 60 microgram/cu m annual secondary standard, with the largest concentration being 16 micrograms/cu m. Calculated annual particulate averages (3-5 micrograms/cu m) are much lower than measured values (25-100 micrograms/cu m) due to natural background dust in this area. Area sources contribute nearly 60% of the total emitted particulates and SO2 emissions, and control of these sources is essential to maintaining or improving air quality. Annual average SO2 concentrations are projected to increase by about 8 micrograms/cu m by 1990, assuming present fuel use patterns and the best available control technology. Within this two decade time frame, the proposed SO2 increment of 15 micrograms/cu m is not expected to be reached; hence, growth of the population or industry will not be limited. Unless natural background contributions of particulates are excluded from calculations, the ambient air concentration limits of Environmental Protection Agency or Sierra Club plans preclude appreciable growth in the area. (Author summary modified)

1973

51112 **APTIC NO. 70835**

Raghavan, S. V.

AIR POLLUTION - LIMITATIONS OF CONTROL TECHNIQUES. *Central Labour Inst., Sion, Bombay (India), Proc. Semin. Air Pollut. Control Tech., India, 1973, p. 58-65. (Sept. 11-12.)*

The development of ambient air and emission standards in India are discussed in relation to standards in the United States and limitations of control equipment, with particular reference to the cement industry. The American ambient air standard for portland cement (60 microgram/cu m) is viewed as too rigid and without foundation when compared to the threshold limit value (8-hour exposure) of 10 mg/cu m. Furthermore, satisfactory methods of sampling, monitoring, and analyzing dust levels have yet to be standardized. Dust-control devices currently being used in the cement industry in India include: various collectors and scrubbers, bag filters, and electrostatic precipitators. The control of kiln chimney emissions with electrostatic precipitation is viewed as unwarranted in terms of excessive costs and questionable public health benefits. Pragmatic standards based on technical feasibility, economic viability, and enforceability are recommended.

51113 **APTIC NO. 70574**

Osaka City Government (Japan)

OUTLINE OF AIR POLLUTION PREVENTION BASIC PLAN - CLEAN AIR PLAN 73. *(Taiki osen boshi kiho keikaku no gaiyo - kurinea puran 73.) Text in Japanese. 23p., Nov. 1973.*

Total emissions of sulfur oxides, nitrogen oxides, and particulates in Osaka in 1972 were 43,960 tons, 35,270 tons, and 32,120 tons, respectively. The SOx and particulates were considerably reduced from previous years as a result of the Clean Air Plan-1971. However, new measures are necessary due to the increase in fuel consumption and motorization. The Clean Air Plan-1973 was introduced based on the previous clean air plan. The new standards and the years for the goal are as follow: SOx, 1-hour average for 24 hr under 0.04 ppm and 1-hour value under 0.1 ppm, 1978; particulates, 1-hour average for 24 hr under 0.10 mg/cu m and 1-hour value under 0.20 mg/cu m, 1981; nitrogen dioxide, 1-hour average for 24 hr under 0.02 ppm, 1981; CO, 1-hour average for 24 hr and 8 hr under 10 ppm and 20 ppm, respectively, 1981; oxidants, 1-hour value under 0.06 ppm, 1981; odors, at insensible level, 1981. The interim goal for NO2 was set in 1978 for 60% completion. Measures taken included strict regulations for new facilities, promotion of relocation, and improvement of the air pollution monitoring network.

1972

51114 **APTIC NO. 72989**

Smith, Wayne C. and Terry L. Thoem

AIR QUALITY CRITERIA AFFECTING THE NATURAL GAS INDUSTRY. *Preprint, Environmental Protection Agency, Denver, Colo., Office of Air Programs and Office of Enforcement, 30p., 1972. (Presented at the Gas Conditioning Conference, 22nd Annual, Norman, Okla., March 16-17, 1972.)*

Air quality criteria affecting the natural gas industry are discussed. Topics covered include: provisions of the Clean Air Act; state implementation plans; the establishment of air quality control regions; primary and secondary ambient air quality standards for sulfur oxides, suspended particulates, nitrogen oxides, carbon monoxide, hydrocarbons, and photochemical oxidants; performance and emission standards; and methods for self-reporting of pollutant emissions to the Environmental Protection Agency. Major sources of information pertaining to air pollution programs are also listed. A copy of the Wyoming air quality standards and regulations is provided as an attachment.

LEGAL AND ADMINISTRATIVE

1975

51115 **APTIC NO. 73015**

Donley, Diane L.

LEGAL ASPECTS OF STRATEGIES FOR THE MAINTENANCE OF CLEAN AIR STANDARDS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 9p., 1975. (Presented at the Specialty Conference on Long Term Maintenance of Clean Air Standards, Chicago, Ill., Feb. 3-4, 1975.)*

A critique of the Environmental Protection Agency s progress in formulating Air Quality Maintenance Plans is presented. No air quality maintenance area designations are yet established, and the present plan does not require maintenance of air quality standards until 1985. The EPAs proposed statewide tracking system for new growth and development does not effectively relate new growth to air quality but rather just monitors all new development. Additional problems in the proposed regulations include a grandfather clause that gives older sources additional time for compliance and the listing of factors which may be used to dilute AQMA quantitative results.

51116 **APTIC NO. 70383**

Guck, Rudolf

REGULATIONS CONCERNING ENVIRONMENTAL PROTECTION AND SITE SELECTION FOR NUCLEAR POWER PLANTS. *(Umweltschutzbestimmungen und Standortwahl fuer Kernkraftwerke). Text in German. Elektrotech. Z. A, 96(1):38-44, 1975. 9 refs.*

Criteria for the selection of a suitable site for a nuclear power plant are given. Limits are imposed by the need of cooling water. The worsening thermal pollution of rivers made the construction of cooling towers necessary. Two problems arose as a consequence of the construction of cooling towers, changes of the micro-climate in the vicinity of the cooling tower and the need to replenish the water losses by evaporation. Extensive investigation of the effects of cooling towers on the environment showed that no drastic impact on meteorology and climate is to be expected but specific meteorological and climatic measurements near each individual cooling tower are an absolute must.

51117 **APTIC NO. 70493**

Hamanaka, H.

A TOTAL QUANTITY CONTROL PROGRAM FOR AIR POLLUTION AND ITS PROBLEMS. *(Taikiosen no soryokisei to sono mondaiten). Text in Japanese. Kankyuo Gijutsu (Environ. Conserv. Eng.), 4(1):20-28, Jan. 1975.*

A total control program for sulfur oxides in air pollution is discussed. The survey methods, including local conditions, total emissions, air quality criteria, and fuel standards are discussed. Controversy over enforcement of total quantity control is outlined. The history and legislation of air pollution control in Japan is explained. Calculation of total emissions is demonstrated, based on legal requirements and present control and measurement technology.

51118 **APTIC NO. 70494**

Hashimoto, M.

THE DIRECTION OF FUTURE ENVIRONMENTAL CONTROL. *(Kongono kankyo kanri no hoko). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 4(1):2-6, Jan. 1975.*

Problems of environmental control are discussed from the viewpoints of the social sciences, natural sciences, and technology. Legislation, demography, economics, and natural resources are discussed in relation to the development of pollution control methods. Enforcement of legislation concerning control technology is the major control strategy at present. An environmental assessment, assessments of chemical compounds, chronic and acute pollution effects, and an integrated policy approach are given.

51119 **APTIC NO. 70793**

Meyers, Sheldon

ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS IMPACTING THE ENVIRONMENT. AVAILABILITY OF COMMENTS. *Federal Register, 40(20):4335-4340, Jan. 29, 1975.*

Appendices containing Federal Agency actions impacting the environment which have been reviewed and commented upon in writing by the Environmental Protection Agency during the period December 1, 1974 to December 31, 1974 are listed. Appendix I contains a listing of draft environmental impact statements reviewed and commented upon in writing and includes the Federal agency responsible for the statement, the classification of the nature of EPA s comments, and the EPA source for copies of comments. Appendix II contains definitions of EPA s comments on the draft environmental impact statement. Appendix III contains a listing of final environmental impact statements reviewed and commented upon in writing. Appendix IV contains a listing of proposed Federal agency regulations and actions reviewed and commented upon in writing. Appendix V contains a listing of the names and addresses of sources for copies of EPA comments. Copies of the draft and final environmental impact statements are available from the originating Federal department or agency.

51120 **APTIC NO. 70755**

Morris, A. R.

STATE OF MARYLAND IMPLEMENTATION PLAN. WITHDRAWAL OF PROPOSED REVISION. *Federal Register, 40(8):2448, Jan. 13, 1975.*

Proposed Maryland implentation plan revisions regarding existing sources of photochemically reactive solvents are withdrawn from further consideration by the Environmental Protection Agency Administrator. The proposed revisions involved regulations for preventing existing sources currently emitting photochemically reaction solvents at rates greater than 550 lb/day in the Metropolitan Baltimore and Maryland portion of the National Capital Air Quality Control Region from increasing their emissions. Specific objections of the Administrator to these regulations were as follows: justification for the 550 lb/day cutoff between regulated and unregulated sources was lacking; the definition of average daily emissions and the base period on which the average was determined were too vague; and the time period over which the emissions would be measured to determine whether or not they were in violation was unclear.

51121 **APTIC NO. 70784**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. IOWA: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(20):4272- 4273, Jan. 29, 1975.*

The approval of revised compliance schedules for Iowa is announced. Each revision establishes a new date by which the source must comply with the applicable emission standard in the federally approved state implementation plans.

51122 **APTIC NO. 70785**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. IOWA: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(20):4270- 4272, Jan. 29, 1975.*

The approval of revised compliance schedules for the state of Iowa is announced. Each approved revision establishes a new date by which the individual source must comply with the applicable emission limitation in the Federally approved State Implementation Plan. Under Iowa law, the compliance schedule is not enforceable after the date on which the associated variance expires and variances cannot extend for more than 1 yr. To the extent that the Iowa schedules extend past the variance expiration date, they are not legally enforceable at this time. The Environmental Protection Agency's approval of each compliance schedule is unconditional only as to that part of the schedule covered by the initial variance. Approval of the remainder of the schedule will be conditioned upon the State's renewal of the variance in identical form and substance to that included in the schedule submitted to the EPA and approved.

51123 **APTIC NO. 70786**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. CALIFORNIA: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(20):4267-4268, Jan. 29, 1975.*

The approval of revised compliance schedules for the state of California is announced. Each approved revision establishes a new date by which the individual air pollution source must comply with the applicable air quality control regulations. Some schedules include incremental steps towards compliance with the specified regulations. The increments of progress, as well as the final compliance date, are legally enforceable by the Administrator of the Environmental Protection Agency pursuant to Section 113 of the Clean Air Act, as amended. The schedules meet the requirements of Sections 51.6 and 51.15. All regulations cited are air pollution control regulations of the air pollution control district where the source is located. Section 52.240 is amended by the addition of the schedules.

51124 **APTIC NO. 70787**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. SOUTH CAROLINA: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 49(16):3568-3569, Jan. 23, 1975.*

The approval of compliance schedules for South Carolina is announced. Each schedule establishes a date by which an individual air pollution source must attain compliance with the emission limitations of the State implementation plan. Many schedules include incremental steps toward compliance with specific dates set for achieving those steps. All schedules satisfy the requirements of 40 CFR Part 51 pertaining to plan revisions and compliance schedules. Approval will not hinder the attainment and maintenance of the national ambient air quality standards.

51125 **APTIC NO. 70788**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. MISSOURI: APPROVAL AND DISAPPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(16):3566-3568, Jan. 23, 1975.*

The approval and disapproval of revised compliance schedules for Missouri are announced. Each approved revision establishes a new date by which the individual source must comply with the applicable emission limitation in the Federally approved State Implementation Plan. All schedules include incremental steps toward compliance with the applicable emission limitations.

51126 **APTIC NO. 70789**

Quarles, John

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. WEST VIRGINIA: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 40(16):3569-3570, Jan. 23, 1975.*

The approval of compliance schedules for West Virginia are announced. Each revision and schedule establishes a date by which an individual air pollution source must attain compliance with an emission limitation specified by the State Implementation Plan. Most schedules include incremental steps towards compliance with interim dates for achieving those steps. Each revision and compliance schedule listed was adopted by the West Virginia Air Pollution Control commission and submitted to the Environmental Protection Agency after notice and public hearings in accordance with the procedural requirements of 40 CFR Part 51.

51127 **APTIC NO. 70696**

Train, Russell E.

AMBIENT AIR MONITORING REFERENCE AND EQUIVALENT METHODS. *Federal Register, 40(33):7042-7044, Feb. 18, 1975.*

Amendments to Part 50-National primary and secondary ambient air quality standards and additions to Part 51- Requirements for preparation, adoption, and submittal of implementation plans of title 40 of the Code of Federal Regulation are presented. The amendments revise Appendices C and D by deleting provisons inconsistent with Part 53, by retitling them to make clear that each specifies only a measurement principle and calibration procedure, and by clarifying that analyzers based on the two appendices will be considered reference methods only if designated. A new 51.17a is added, reading, in part: Each method for measuring sulfur dioxide, carbon monoxide or photochemical oxidant used for purposes of 51.17a shall be a reference method or equivalent method as defined in 53.1. Concentrations of particulate matter shall be measured by the reference method specified in Appendix B to Part 50 and by the tape sampler method.

51128 **APTIC NO. 70763**

Train, Russell E.

PART 53-AMBIENT AIR MONITORING REFERENCE AND EQUIVALENT METHODS. *Federal Register, 40(33):7044-7064, Feb. 18, 1975. 7 refs.*

The provisions of the new Part 53-Ambient Air Monitoring Reference and Equivalent Methods of Title 40 of the Code of Federal Regulations are presented. Subpart A contains the general requirements to be satisfied for a reference or equivalent method determination for both automated methods and manual methods. Any automated method for measuring carbon monoxide or oxidants may be designated as a reference method if it is based on the specified measurement principle and calibration procedure. Candidate automated methods designed to measure sulfur dioxide, CO, or photochemical oxidants will be designated as equivalent methods if they meet the performance requirements. Subpart B specifies performance requirements for automated methods and procedures for testing the performance characteristics of candidate methods. Subpart C contains the general provisions and test procedures necessary for demonstrating a consistent relationship between candidate methods and reference methods.

51129 **APTIC NO. 73107**

Environmental Protection Agency, Washington, D. C., Office of Toxic Substances

ACTIVITIES OF FEDERAL AGENCIES CONCERNING SELECTED HIGH VOLUME CHEMICALS. *Rept. EPA-560/4-75-001, 33p., Feb. 1975. 16 refs.*

Research and regulatory activities of the Environmental Protection Agency and other Federal agencies directed toward 50 high volume chemicals are summarized. Over half of the high volume chemicals are hydrocarbons and other organic compounds, and 43 are included on the Toxic Substances List of the National Institute for Occupational Safety and Health. Substances other than hydrocarbons among the high volume chemicals include: organic and inorganic acids, ammonia, oxygen, nitrogen, nitrates, alcohols, ketones, chlorintated hydrocarbons, epoxides, sulfates, aldehydes, and nitriles. The EPA is presently studying the significant sources of particular hydrocarbons and intends to set standards for their control. Regulations are also being developed to limit vinyl chloride emissions from industrial manufacturing sources.

1974

51130 **APTIC NO. 70591**

Asakawa, Teruhiko

AIR POLLUTION PROBLEMS IN THE SOVIET UNION. *(Soren no taiki osen mondai). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(8):9-16, Aug. 1974. 6 refs.*

The historical background of laws and regulations concerning environmental protection beginning with the first control regulation issued on June 25, 1935 are reviewed. In the Soviet Union, the administration of environmental protection is under the jurisdiction of the Ministry of Health rather than an independent administrative agency such as the Environmental Agency of Japan or the Environmental Protection Agency of U.S.A. The description of four basic environmental protection laws, the Nature Protection Law, Health Law, Land Law, and Water Resource Law and three major sources of atmospheric pollution, industries, TETs (thermal power stations), and automotive exhaust emission are given. For the control of industrial exhaust emissions, a dust collector is used. For the other pollutants, however, control is largely dependent on the atmospheric dispersion method by means of high smoke stacks. The uniqueness of the Soviet thermal power station is that it supplies hot water and hot water heating as well as electricity, which is called TETs. The long history of TETs which began in 1924 and its present status are reviewed with a description of advantages and related pollution problems. The pollution control system is based on the permissible concentration, and neither the total emission control regulations nor the emission control standard are used. Some of the atmospheric pollution control measures taken are described.

51131 **APTIC NO. 73027**

Faith, W. L.

CRITIQUE OF SOLVENT REACTIVITY, RULE 66, AND APPENDIX B. *Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., (Solvent React. Conf. Proc., Research Triangle Park, N. C., 1974). EPA-650/3-74-010, P. 30-32. (Nov.)*

Proposals relating to the regulation of photochemically reactive compounds emitted to the atmosphere are presented. The following classifications are suggested for such emissions: high reactivity (organics mixed with nitrogen oxides in stated ratios prior to emission); moderate reactivity (all non-aromatics containing a carbon-carbon double bond and all di-substituted and higher aromatics); low reactivity (all non-aromatics not containing a carbon-carbon double bond and not in the negligible reactivity class); and negligible reactivity (compounds now in Appendix B of Rule 66). Relating the degree of control to volatility for each class is also suggested, and the control of emissions for a given evaporated solvent to a similar degree as other organic emissions is proposed. A referee system and test protocol for establishing the relative reactivity of specifically questioned compounds and for relating their relative reactivity to two or three standard compounds is recommended.

51132 **APTIC NO. 71358**

Fuji, T., K. Minagi, Y. Yano, M. Nagi, S. Yoshimatsu, and S. Matsuo

AIR POLLUTION AND ITS CONTROL IN UBE CITY. *(Ube-shi no taiki osen to sono taisaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution) 9(2):519, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 366.)*

The sulfur dioxide level in Ube city was lowered to a yearly average of 0.034 ppm with the cooperation of areal industries in 1973. The average cut in fuel sulfur required of industry was 30% of 1969 levels and additional chimney height (200%) was also required. A further agreement with the areal industries has become necessary to meet the 0.012 ppm level set for the years 1974 through 1977. The average sulfur cut in fuel is expected to be 67.57% of the present levels (1973).

51133 **APTIC NO. 70546**

Fujiwara, Buheita

AN OBSERVATION OF THE POLLUTER-PAYS PRINCIPLE (PPP)---DISCUSSIONS OF THE OECD ENVIRONMENTAL COMMITTEE. *(Osensha futan no gensoku (PPP) ni tsuite no ichikosatsu---OECD kankyo iinkai no giron o chushin ni). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(8):1-8, Aug. 1974.*

The background and circumstances for adopting the Polluter-Pays Principle (PPP) for the cost of remedying environmental problems by OECD (Organization for Economic Cooperation and Development) is described. The recommendations of the Council on the Guiding Principles Concerning International Economic Aspects of Environmental Policies adopted on May 26, 1972 concerning the cost allocation, environmental standards, national treatment and non-discrimination, procedure of control, compensating import levies, and export rebates is summarized. The Note on the Implementation of the PPP adopted at the November 27-29, 1973 Meeting concerning the definition of PPP, instruments for applying the PPP, and exceptions to the PPP is also summarized. The PPP is based on the theoretical premise of the statistical market, the substitution of product or service, and internationally unified role sharing for pollution measurement (both publicly and privately). This premise is discussed in reference to the Japanese pollution control laws, finance, taxation system, and participation of industries in pollution control measures.

51134 **APTIC NO. 65242**

Goldberg, Robert

LET S POLLUTE-LEGALLY. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 20p., 1974. (Presented at the Air Pollution Control Association Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-103.)*

The variance procedures used by Illinois to attain compliance with stringent regulations is compared with generally used Appeals Boards. A full description of the Illinois program including the Institute for Environmental Quality, the Pollution Control Board, and the Environmental Protection Agency is given with a breakdown of a $15 million budget and how over 200 variances and 1000 compliance plans are monitored. The variance method is more powerful than a voluntary cooperative method, but is much more expensive to operate and requires more technically qualified people. The experience of Illinois with the Federal EPA compliance plan requirements is discussed to show the connection and similarity between variances and compliance plans. Examples of method used to follow both compliance plans and variances are given and the relationships of these to the milestones or interim program steps is shown. The interim control steps proposed in the Federal Register are not always applicable or practical, but provide guidelines which agencies can use. (Author abstract modified)

51135 **APTIC NO. 70606**

Gorczyca, Miroslaw

ENVIRONMENTAL PROTECTION IN EAST GERMANY. *(Ochrona srodowiska naturalnego w Niemieckiej Republice Demokratycznej). Text in Polish. Gaz, Woda i Tech. Sanit. (Warsaw), 48(4):124-127, 1974. 6 refs.*

Problems posed by air pollution to ecology and measures taken to protect the environment of East Germany are presented. The economic damage caused by air pollution was estimated as being 50% damage caused by corrosion and other factors. In 1972 the chemical industry invested $80,000 in abatement installations concentrated in the Halle industrial region, where 45% of the chemical, 40% of the cement, and 35% of the metallurgical industries are located, and where 25% of the electrical energy is generated. The Meteorological Bureau performs an information, preventive, control, and repressive activity concerning the tresspassers causing air pollution. Use of natural gas increased from 1,000,000,000 ton in 1970 to 7,000,000,000 tons in 1973. Carbon dioxide emissions will decrease by 2,000,000 tons, sulfur dioxide emissions by 300,000 tons, and dust emission by 200,000 tons. All new industrial facilities generating electrical energy must have an abatement installation with a dust retaining efficiency of 97 to 99%. The construction of new filtering and scrubbing installations and reconstruction of old ones on plant chimneys cost $16,000,000 in 1972. Areas of East Germany are being zoned into environmental protected areas. There is an excellent atmosphere of cooperation between scientists and industry in East Germany, favorizing environmental protection.

51136 **APTIC NO. 73092**

Hall, E. H., R. H. Cherry, Jr., and G. R. Smithson, Jr.

WEIGHING ENVIRONMENTAL COSTS AND BENEFITS. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 203-235, Oct. 1974. 13 refs.*

A methodology to assess the environmental factors related to a selected number of fuel/energy systems was developed. It involves the compilation and organization of effluent data and the evaluation of the combined effects of extraction, transportation, processing, and utilization of fuel to produce energy. It provides a technique for ranking the fuel/energy systems from an environmental standpoint. Air emissions associated with coal utilization can be decreased to approximately the equivalent of those being emitted from systems using natural gas. The control of sulfur dioxide emissions from coal and oil combustion needed to achieve ambient air quality standards can be technically achieved in the 1975-1990 time period. Near the end of that period, regenerative stack gas cleaning technologies, such as magnesium oxide scrubbing, and advanced combustion techniques, such as fluidized bed combustion of coal and oil, can be made available which will achieve equivalent reduction of air emissions with only a moderate increase in the production of solid waste. (Author abstract modified)

51137 **APTIC NO. 70530**

Hansler, Gerald M.

ROCKAWAY TOWNSQUARE SHOPPING CENTER. APPROVAL AND PROMULGATION OF IMPLEMENTATION PLAN: OPPORTUNITY FOR PUBLIC COMMENT ON INDIRECT SOURCE APPLICATION. *Federal Register, 39(245):43870-43871, Dec. 19, 1974.*

The application for a permit to construct the proposed Rockaway Townsquare Shopping Center in Rockaway Township, Morris County, New Jersey is described, and public comment is solicited. Since shopping centers attract mobile source activity and pollution, a permit is required before construction of this indirect source may begin. A preliminary review of the air quality impact of the proposed project indicated that the 8-hour national carbon monoxide standard of 9 ppm would be marginally violated at one intersection. The maximum 8-hour CO concentration was predicted to be 10 ppm in 1976 at the intersection. A more extensive review of the area will model all intersections and areas within the parking lot to predict the maximum 8- and 1-hour concentrations in 1976.

51138 **APTIC NO. 70521**

Hishida, Kazuo

POLLUTION CONTROL PROJECT IN TOKYO. *(Tokyo to no kogai boei keikaku). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(12):25-36, Dec. 1974.*

The plan for protecting residents from pollution was originally issued in 1971, revised three times, and the 1974 version issued in April 1974. The summary of the 1974 version of air pollution control measures is given which includes the status on pollution, investigations on pollutant sources for sulfur oxides, nitrogen oxides, carbon monoxide, hydrocarbons, dust particulates and aldehydes, and investigations on pollution due to automobiles. The target value for environmental protection and target date were determined, and the necessary amount of reduction in pollutant concentration and the allowable emission quantity for each pollutant were calculated. Various reduction methods and reduction plans are described, and the effects of such control measures are estimated.

51139 **APTIC NO. 70524**

Iwatani, Eiji

COUNTERMEASUREMENTS OF AIR POLLUTION CONTROL IN GUNMA PREFECTURE. *(Gunma-ken ni okeru taiki osen boshi taisaku). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(12):62-73, Dec. 1974. 7 refs.*

The geographical location and climate in Gunma Prefecture and status of industrial development, pollution problems, and various control measures taken are reviewed. The air pollution is generally localized due to specific pollutant sources, unlike the complex pollution in a larger industrial area. The case studies of some representative areas are given. The data on sulfur oxides pollution, heavy oil consumption, settling particulates, pollution due to automotive exhaust gas, fluoride compounds, and photochemical smog are compiled and analyzed. The standards for issuing forecasting, warning, alert, and emergency alerts are outlined. Yasunaka and Shibukawa areas, which represent typical pollution areas, were designated as areas for observation; and data on SOx pollution and cadmium pollution of food, particularly of rice and drinking water, were compiled and analyzed. The pollutant source control measures, health protection measures, environmental protection measures, and control measures for agricultural products are described. The air pollution monitoring system and other approaches to pollution problems are also discussed.

51140 **APTIC NO. 73480**

Jacquinot, Pierre

OPERATION CONTROL OF COMBUSTION EQUIPMENT. *(Operation Controle des Installations Thermiques). Text in French. In: Etudes de pollution atmospherique a Paris et dans les departements peripheriques en 1973. Prefecture de Police, Paris (France), Laboratoire Central, 7p., June 1974.*

The activity of the Police Department of Paris in the supervision of combustion equipment, the identification of emission sources in the case of complaints, and in related public information is described, and some results of inspections are presented. Combustion equipment, domestic or otherwise, is systematically inspected for proper state of repair, functioning, fuel economy, and for pollutant emissions, especially in special protection zones. The flue gases showed an opacity exceeding 6 Bachrach units in 8.4% of all cases, a percentage comparable to those obtained in previous years. Poor thermal efficiency, associated with carbon monoxide emissions over 6%, was determined in 17.5% of all cases. The findings indicate the need for systematic inspection of combustion equipment for emission abatement and fuel economy.

51141 **APTIC NO. 70453**

Kaplin, Edward J., Richard J. Monro, and Courtney Alvey

AN INTERDISCIPLINARY APPROACH TO IDENTIFICATION OF AND SOLUTION TO LOCAL FALLOUT PROBLEMS. *Preprint, York Research Corp., Stamford, Conn., 6p., 1974.*

A multidisciplined field program was established for the simultaneous measurements of meteorological and air quality parameters, source emissions, and plant operating conditions to identify and define the problem of fallout in the vicinity of an East Coast utility and to develop corrective procedures. The necessity for discrete time correlation of data necessitated the development of a unique sequential filter exposure device which was used in conjunction with the more conventional instrumentation and equipment. Preliminary evaluations showed that the fallout variables were interdependent to the degree that operational procedures which in themselves have the potential to produce fallout, do so only under generally definable meteorological conditions. (Author abstract modified)

51142 **APTIC NO. 70849**

Lafleur, R. J.

A RATIONAL AIR POLLUTION SURVEILLANCE NETWORK DESIGN. *Preprint, North Atlantic Treaty Organization Committee on the Challenges of Modern Society, Expert Panel on Air Pollution Modeling, 15p., 1974. 3 refs. (Presented at the Expert Panel on Air Pollution Modeling, 5th Meeting, Roskilde, Denmark, June 4-6, 1974.)*

The application of dispersion modeling to the design of an air pollution surveillance network is discussed. The design of an air pollution surveillance network is possible with the aid of two complementary tools: the emission inventory and the dispersion model. Simple climatological models are capable of providing reliable information for the design of networks and can operate within the constraints of such a network, providing the pollutants under consideration are limited to sulfur dioxide and particulates. Implementation of such models for these pollutants is recommended. Research on the development of similar simple models for the dispersion of automotive and photochemical pollutants is also suggested. The stages in the design of an air pollution surveillance network are: the identification of areas in need of surveillance; identification of the pollutants present and the type and number of monitors necessary; the determination of general locations for monitoring stations, followed by the determination of actual monitoring locations according to physical constraints; the selection and design of actual equipment installations; the establishment of operating and maintenance procedures; the establishment of data collection, handling, and reporting procedures: and the evaluation of overall network design after a reasonable trial period, with the implementation of appropriate revisions.

51143 **APTIC NO. 73074**

Mackenthun, Kenneth M.

ENVIRONMENTAL QUALITY AND STANDARDS FOR WATER. *In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology (May 1974, St. Louis, Missouri). Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1325, Task 6, Program Element 1AB013, Rept. EPA-650/2-74-118, ROAP 21ADD, 21AFJ, p. 11-14, Oct. 1974.*

Legislation on environmental quality and standards for water is reviewed. The Federal Water Pollution Control Act Amendments of 1972 provide a framework of comprehensive and interrelated laws and actions for the protection, preservation, and enhancement of the water environment. The national policy is that the discharge of toxic pollutants in toxic amounts is prohibited. There is need for an environmental ethic that reflects the ecological conscience and conviction of individual and corporate responsibilities and that would help water, land, and air in its natural self-renewal.

51144 **APTIC NO. 70597**

Murase, A., J. Kobayashi, and M. Terabe

A CALCULATION METHOD FOR TRAFFIC VOLUME IN KAWASAKI. *(Kawasaki shinai no shashu betsu soko daisu no sanshutsu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):485, Nov. 1974. (Presented at the 15th National Air Pollution Research Conference, Chiba, Japan, Nov. 6-8, 1974, Paper 331.)*

To formulate an overall control plan for nitrogen oxides pollution by automotive exhaust gas, traffic volume by vehicle type in Kawasaki city was calculated based on a mathematical grid and aerial photography. Based on the table utilizing vehicle type and time ozone data, the traffic load was distributed at arbitrarily selected spots on the road network. At this point the driving speed on each link (distance between two intersections) was corrected in regard to the ratio of traffic capacity and traffic volume. A similar calculation was made for the second traffic distribution, and the calculation was repeated until all the nodes in network were selected. The result was corrected with data obtained by aerial photographs for the calculation of traffic volume by vehicle type and time zone.

51145 **APTIC NO. 70523**

Okamoto, Hisashiro

AIR POLLUTION CONTROL PROJECT IN IBARAGI PREFECTURE. *(Ibaragi-ken no taiki kanri keikaku). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(12):52-59, Dec. 1974.*

The status of industrial development and environmental pollution in Ibaragi Prefecture are reviewed. The number of newly constructed factories during the period of 1960 to 1972 was 1036, and the sulfur oxides load calculated based on the sales volume of heavy oil increased from 142,000 tons/yr in 1966 to 203,700 tons/yr in 1972. The data on SOx, nitrogen oxides, settling and suspended particulates and photochemical oxidant concentrations measured primarily at Hitachi and Kashima industrial areas are compiled and analyzed. The air pollution control measures taken by means of atmospheric monitoring and administrative guidance are described. The air pollution monitoring system being installed in the Kashima area which is connected the monitoring center will provide instantaneous information and pollution forecasting.

51146 **APTIC NO. 70366**

Okutsu, Haruo

PROCEDURES FOR ENVIRONMENTAL ASSESSMENT. *(Kankyo asesumento no shuho (sogo chosa)). Text in*

Japanese. Preprint, Science Council of Japan, p. 43-44, 1974. (Presented at the Domestic Symposium for International Environment Preservation Science Conference, 2nd, Tokyo, Japan, June 13-15, 1974.)

The structure and procedure for the environmental assessment for general improvement for the future society are suggested. The steps include the study of the formation and condition of the environment, and the process of cumulative disturbances of the environment over a long period of time for the air, water, and soil and their effects on the future society; the cultural and sociological condition based on or closely related with nature and human coexistence; and the problems and projects induced from the above investigation which will lead to a general assessment of nature protection plan and idealistic land use plans. The project teams will be divided into basic science, applied science, and environmental science, and this last team will include research for air pollution, water pollution, soil pollution, deterioration and animals and plants, and solar radiation.

51147 **APTIC NO. 73025**

Porter, F.

EPA CRITIQUE OF RULE 66 AND APPENDIX B. *Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., (Solvent React. Conf. Proc., Research Triangle Park, N. C., 1974), EPA-650/3-74-010, p. 23-28. (Nov.)*

A critique of the Rule 66 approach versus the Appendix B approach to the control of photochemical oxidants is given. The Rule 66 approach limits the emission of a few very reactive hydrocarbons much more severely than the emissions of other hydrocarbons, while the Appendix B approach severely limits the emission of all but a few nonreactive hydrocarbons. Neither approach by itself is totally effective at present. Although the Rule 66 approach is conceptually more sophisticated, the approach may be completely ineffective in areas where all hydrocarbons emitted into the atmosphere appear to contribute to local concentration levels of oxidants. A low reactivity rating does not necessarily mean that a particular hydrocarbon does not contribute to the formation of photochemical oxidants. The Appendix B approach which controls all but a few hydrocarbons is more pragmatic in terms of reducing all hydrocarbon emissions as much as possible. The recognition that transport of oxidants and hydrocarbons from surrounding areas into a local area is possible makes the Appendix B approach more suitable. Thus, in those situations where the implementation of the Appendix B approach is feasible, its implementation as fully as possible is recommended; the Rule 66 approach can be implemented as an interim measure where the Appendix B approach is not a viable alternative.

51148 **APTIC NO. 70757**

Quarles, John

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. GASOLINE VAPOR RECOVERY REGULATIONS; REVISED COMPLIANCE DATES FOR STAGE. *Federal Register, 39(229):41252-41253, Nov. 26, 1974.*

Changes in interim compliance dates for regulations pertaining to the collection of vapors displaced during the filling of storage tanks with gasoline (Stage I) are promulgated by the Environmental Protection Agency Administrator. The changes delay the date for sources to enter and sign contracts for control systems from November 1, 1974 to March 1, 1975 and delay the date for sources to initiate on-site construction or installation of emission control equipment from January 1, 1975 to May 1, 1975. The revised dates affect regulations for California, Colorado, District of Columbia, Indiana, Maryland, Massachusetts, New Jersey, Pennsylvania, and Virginia. Good cause exists for promulgating the changes without taking public comment since the EPA has not yet acted on many control plans and is preparing guidelines in this matter.

51149 **APTIC NO. 70759**

Ravan, Jack E.

KENTUCKY. APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 39(235):42377-42379, Dec. 5, 1974.*

A regulation providing a categorical compliance schedule for indirect heat exchanger sources of sulfur dioxide in the Commonwealth of Kentucky is proposed and offered for public comment by the Environmental Protection Agency Administrator. The proposed compliance schedule requires that sources not presently in compliance with Kentucky Air Pollution Control Regulation AP-4, Section 1.(2), 2.(3), or 1.(4) take specific action to achieve compliance by the dates specified in the state regulation. A source that is in compliance may be exempted from such action only by certifying compliance to the administrator by March 15, 1975. Notice of a public hearing on this proposal is given elsewhere in this Federal Register issue, and interested persons may participate in this rulemaking by submitting written comments to the Regional Administrator of the EPA. All comments are available for public inspection.

51150 **APTIC NO. 70801**

Ritt, Leonard G. and John M. Ostheimer

CONGRESSIONAL VOTING AND ECOLOGICAL ISSUES. *Environ. Affairs, 3(3):459-472, 1974. 20 refs.*

An analysis of environmental voting patterns among congressmen in the House of Representatives is presented based on annual evaluations made since 1970 by the League of Conservation Voters. Relationships between environmental voting and partisanship, political ideology, constituency characteristics, geographic region, and congressman age are statistically examined. The hypothesis that those districts containing the most environmentally aware sectors of the population are represented by the most environmentally aware congressmen is only partially borne out by the data. Partisanship and political ideology appear to be much more significant than district characteristics in explaining environmental voting patterns. Political liberals in both parties are the strongest supporters of environmental legislation.

51151 **APTIC NO. 70800**

Shields, Linda P. and Marvin C. Ott

ENVIRONMENTAL DECAY AND INTERNATIONAL POLITICS: THE USES OF SOVEREIGNTY. *Environ. Affairs, 3(4):743-767, 1974. 36 refs.*

The implications of environmental pollution on international politics are analyzed. Long-term solutions to environmental problems appear to necessitate a restructuring of international politics away from the state system toward various forms of international authority since pollution (air and water) crosses national boundaries. Acid rains in Sweden, for example, are the result of industrial activities in Britain and Central Europe. In many instances of transnational pollution, however, there is no identifiable source of origin and no single victim involved, thus precluding the instigation of bilateral or multilateral discussions between interested governments. Thus the eventual emergence of an international political system in which supranational institutions capable of coping with global problems are preeminent seems likely.

51152 **APTIC NO. 70104**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. APPROVAL OF PLAN REVISION: VIRGINIA. *Federal Register, 39(229):41254, Nov. 26, 1974.*

Approval is given to revisions to the implementation plan for the attainment and maintenance of national ambient air quality standards for Virginia. The revisions cover an operations manual outlining the administrative procedures to be followed in the event of an emergency episode, the air quality surveillance section of the original implementation plan, amendments to various sections of the Code of Virginia, an amendment dealing with odor and open burning regulations, and amendments changing sulfur oxide air quality standards. Several corrections to the implementation data are also approved.

51153 **APTIC NO. 70754**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NEW YORK; COMPLIANCE SCHEDULE REVISION. *Federal Register, 39(229):41253-41254, Nov. 26, 1974.*

Compliance schedule revisions in the New York State implementation plan are approved by the Environmental Protection Agency Administrator in a notice of final rulemaking. The revisions assure that increments of progress are provided for fuel burning sources in the Niagara Frontier Region as part of New York s control strategy for sulfur dioxides. Part 226 of Subchapter A, Chapter III, Title 6 of New York s Official Compilation of Codes, Rules and Regulations imposes a sulfur in fuel limitation on fuel burning sources until October 1, 1975 when a more stringent limitation will be imposed. An immediately effective periodic reporting requirement on all major fuel distributors is also imposed.

51154 **APTIC NO. 70756**

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. APPROVAL OF PLAN REVISIONS; IDAHO. *Federal Register, 39(229):41253, Nov. 26, 1974.*

Approval is granted by the Environmental Protection Agency Administrator revisions submitted by the state of Idaho on August 15, 1973. The revisions include legislative amendments to Idaho legal authority along with an accompanying Attorney General s opinion regarding their adequacy as compared to the requirements of 40 CFR Part 51.11. Disapproved is the provision of Section 39-111 of the Idaho Code relating to the legal authority to make emissions data available to the public. Section 39-111 does not comply with the requirements of 40 CFR 51.11(a)(6) is that public availability of source emissions data is not assured.

51155 **APTIC NO. 70796**

Tsunakawa, Masao

GOVERNMENTAL PROJECTION FOR ATMOSPHERIC PROTECTION, CASE OF TOCHIGI PREFECTURE. *(Tochigi ken no taiki hozen gyosei no suishin ni tsuite). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(12):45-52, Dec. 1974.*

The industrial development in Tochigi Prefecture has far exceeded the 10 year development plan set in 1970, and the problems of environmental pollution including photochemical smog and acid rainfall are widespread. The basiic pollution control plan formulated for the 1973-1980 period which includes the environmental protection administrative system, pollution monitoring and investigation system, pollutant source control measures, pollution control devices and facilities, handling system for pollution complaints and disputes and solid waste treatment systems is described. The status of air pollution and incidence of pollution related afflictions is discussed based on the data compiled. The administrative approaches to promoting the above-mentioned six basic policies for environmental protection are discussed.

51156 **APTIC NO. 71263**

Walton, John W.

DISPOSAL OF AGRICULTURAL WASTE BY CONTROLLED BURNING - A REGULATORY VIEWPOINT. *Air Pollution Control Assoc., Pittsburgh, Pa., Southern Section and Technical Council, Control Technol., Agric. Air Pollut., Memphis, Tenn., 1974, p. 16-28. 8 refs. (March 18-19.)*

State regulations related to open burning in agricultural operations are reviewed. Some states exempt agricultural open burning, while others use sophisticated meteorological systems to limit the emission of such combustion products as particulates, sulfur oxides, carbon monoxide, hydrocarbons, and nitrogen oxides. Some states are examining the possibility of using mobile field incinerators in place of open burning. While some states substitute equipment specifications or operating parameters in lieu of mass emission standards, visible emission standards are applied to all types of incinerators. Although mass testing requirements are contained in state regulations, the visible emission standards are normally used in controlling air pollution from agricultural operations. Only a few states define odors as air pollution, and most of the regulating of odors associated with agricultural waste disposal is probably on a nuisance basis. (Author summary modified)

51157 **APTIC NO. 70674**

Werczberger, Elia

IMPLICATIONS OF AIR POLLUTION FOR THE SEPARATION AND MIXTURE OF LAND USES. *Isr. J. Technol., vol. 12:99-104, 1974. 4 refs. (Presented at the Israel Ecological Society, Scientific Conference, 4th, April 1973.)*

The implications of air pollution on the location of land uses which differ with regard to pollutant emission rate and sensitivity to pollution are discussed. Assuming that there are only two sites with an unlimited supply of land, no segregation of activities will result in market equilibrium. If land constraints are effective, there will be an incentive for the activity with the lower emission rate per acre to initiate a local policy which excludes the other activity. However, if such a policy is not identical with the market equilibrium, it will be inferior in terms of total pollution costs. Thus, while local discriminatory policies reduce the cost to a limited population, they are, in terms of overall welfare, not superior to the market equilibrium and may be inferior. (Author abstract modified)

51158 **APTIC NO. 70511**

Wohlgemuth, R.

CONSIDERATIONS CONCERNING A PRAGMATIC TAX STRATEGY WITH REGARD TO AN ENVIRONMENT ORIENTED ENERGY POLICY - ENVIRONMENTAL PROTECTION TAX AS ALTERNATIVE TO REGULATIONS. *(Ueberlegungen zu einer pragmatischen Gebuehrenstrategie im Rahmen einer umweltorientierten Energiepolitik - Umweltgebuehren als Alternative zur Auflage). Text in German. Brennstoff-Waerme- Kraft, 26(12):491-494, Dec. 1974. 13 refs.*

After a critical review of the present regulations imposed on power plants with the purpose of reducing emissions, the environmental protection tax is described as an alternative. Introduction of such a tax would leave a great deal of uncertainty concerning its effect. For reduction of this uncertainty a tax simulation model has been developed which, by using the example of the sulfur dioxide emissions from power plants, attempts to find the required tax height for guaranteeing a certain pre-determined emission level. The described environmental protection tax would lead to substitution processes between individual (more or less polluting) energy carriers and production processes. The extent of the tax-induced substitutions can be expressed by cross price elasticities (a parameter measuring the relative quantity change of a merchandise X as a consequence of the relative price change of merchandise Y) which must be empirically determined.

51159 **APTIC NO. 69985**

Office of Air and Water Programs, Research Triangle Park, N. C., Control Programs Development Div.

GUIDELINES FOR DESIGNATION OF AIR QUALITY MAINTENANCE AREAS. *Rept. EPA-450/4-74-001, OAQPS 1.2-016 rev., 114p., Sept. 1974. 6 refs.*

NTIS: PB 239663/AS

Guidelines for designation of air quality maintenance areas were devised to assist the states in identifying and proposing Air Quality Maintenance Areas (AQMAs). They contain criteria which the states may use in designating such areas. If the states fail to designate such areas within the timetable specified by Environmental Protection Agency regulations, EPA shall use the criteria developed in the guidelines to establish AQMAs. Example calculations are presented for carbon monoxide, sulfur dioxide, and hydrocarbons/photochemical oxidants using the back-up method of estimating emissions. (Author abstract modified)

51160 **APTIC NO. 70575**

POLLUTION HEALTH DAMAGE COMPENSATION LAW ENFORCEMENT PROCEDURES AND REGULATIONS. *(Kogai kenko higai hoshoho shikorei, kisoku). Text in Japanese. Kankocho Kogaisenmon Shiryo (Public Nuisance Gaz.), 9(5):3-35, Sept. 1974.*

An outline of the Japanese pollution-caused health damage compensation law enforcement procedures and regulations, the conten of the entire ordinance No. 295, the amount of compensations, the degrees of damages, the areas subject to pollution and eligibility, and application methods are described. The areas subject to the ordinance are parts of Yokohama and Kawasaki in Class I (Air Pollution), and parts of Niigata and Toyama in Class II (Water pollution). The types of diseases covered by Class I are chronic bronchitis, bronchial asthma, asthmatic bronchitis, emphysema, and deuteropathy to these diseases. As a resident requirement for eligibility, the claimant should have lived in the area for two years for chronic bronchitis and deuteropathy, and one year for bronchial asthma, asthmatic bronchitis, and deuteropathy, and three years for emphysema and deuteropathy; these requirements also apply to commuters. The effective period is three years for chronic bronchitis, bronchial asthma, emphysema, and deuteropathy, and two years for asthmatic bronchitis and deuteropathy. For those receiving compensation, reevaluation of damage is due in one year. The compensation period for the surviving families is 10 years. A pollution emission tax is charged to those industries exceeding a certain amount of emissions. The taxable scale of emission sources in pollution control areas are plants with the maximum gas per hour of more than 5000 cu m, and in other areas, more than 10,000 cu m. The tax unit is 1 cu m of SOx obtained by converting emission at temperature zero and pressure one, and the charges are 5 cents in control areas and 1/2 cent in other areas per 1 cu m

51161 **APTIC NO. 70749**

CONTROL OF AIR POLLUTION AND NOISE CONTROL: STANDARDS FOR MOTOR VEHICLES. *Intern. Digest Health Legislation, 25(3):623-624, 1974.*

The exemption of certain vehicles from provisions of the Traffic Act of 1972 dealing with the emission of gaseous pollutants from spark ignition and diesel engines and diesel engines and with sanitary installations for motor vehicles is covered in 1973 and 1974 amending regulations. Exempted vehicles are those for which a type approval certificate or a certificate of conformity has been issued under the Motor Vehicles (Type Approval) Regulations. The exemptions apply insofar as the vehicles conform to the relevant provisions of the Directives of the Council of the European Economic Community specified in Council Directive 70/157/EEC (relating to permissible sound levels and exhaust systems of motor vehicles), Council Directive 70/220/EEC (relating to control measures against gaseous pollutants from positive-ignition engines), and Council Directive 72/306/EEC (relating to anti-pollution measures for diesel engines).

51162 **APTIC NO. 70795**

COUNTERMEASURES AGAINST POLLUTION IN TOCHIGI PREFECTURE. *(Tochigi-ken no kogai to taisaku). Text in Japanese. Kankyo Kenkyu (Environ. Studies), no. 8:60-69, Nov. 1974.*

With rapid industrial development, the number of pollution complaints registered increased to 1082 cases in 1972, which was 219 cases more than the previous year. The characteristics of pollution problems in Tochigi and the prospects for pollution control are discussed. On the categories of water pollution, air pollution, noise pollution, malodor pollution, solid waste treatment and others, the present status is reviewed with data compiled, and control measures are described in reference to the 1973 environmental protection plan based on six basic policies concerning environmental protection administrative systems, pollution monitoring and investigation systems, pollution control devices and facilities, pollution source control measures, handling systems for pollution complaints and disputes, and industrial waste treatment systems.

51163 **APTIC NO. 73041**

U. S. Navy, Port Hueneme, Calif., Navy Environmental Support Office

DIRECTORY OF FEDERAL CONTACTS ON ENVIRONMENTAL PROTECTION. *NESO Rept. 20.2-001, 104p., Nov. 1974.*

A directory of listings of persons in selected Federal agencies who are engaged in or provide support to programs concerned with protection and enhancement of the environment was compiled. The listings consist of persons who are engaged in day to day activities concerning environmental matters. The directory is intended primarily for participants and users of the Naval Environmental Protection Support Service in establishing contacts and coordination within the environmental field. The agencies include: the Depts. of Defense, Commerce, and Interior; the Navy, Marine Corp., Air Force, Army, and Coast Guard; the Environmental Protection Agency, the Council on Environmental Quality; and the Western Federal Regional Council - Task Force for Hazardous Waste Management.

51164 **APTIC NO. 73150**

General Accounting Office, Washington, D. C.

REVIEW OF THE AUTOMOBILE FUEL ECONOMY TESTING AND LABELING PROGRAM. *Rept. B-166506, 31p., Aug. 15, 1974.*

The automobile fuel economy and labeling program is reviewed. The automobile emissions testing and certification program of the Environmental Protection Agency is described, and the possible transfer of the program from the EPA to another Federal agency is discussed. Automobiles are tested on a dynamometer at the equivalent of 7.5 mi at an average speed of 20 mph using a driving cycle which simulates driving conditions in a typical urban area. During the test the amount of carbon monoxide, unburned hydrocarbons, and carbon dioxide are measured.

1973

51165 **APTIC NO. 73021**

Goeller, Bruce F.

SAN DIEGO CLEAN AIR PROJECT: SUMMARY REPORT. *Rand Corp., Santa Monica, Calif., Environmental Protection Agency and County of San Diego Environmental Development Agency Contract 6704-0270-E, Rept. R-1362-SD, 147p., Dec. 1973. 33 refs.*

Air pollution control strategies were analyzed for San Diego in terms of their various environmental, transportational, economic, and distributional impacts on San Diego. An overall strategy for the region, termed a mixed strategy, combines three types of pure strategy: fixed source controls, retrofit devices and inspection/maintenance policies for light duty motor vehicles; and transportation management. A screening process was used to compare prospective pure and mixed strategies as to their cost effectiveness in reducing emissions. In this contest, the cost of a strategy for procurement and operation was annualized, and its effectiveness was calculated in terms of how much it reduced emissions, primarily of reactive hydrocarbons. (Author summary modified)

51166 APTIC NO. 73149

Mikolowsky, W. T.

SAN DIEGO CLEAN AIR PROJECT - THE MOTOR VEHICLE EMISSION AND COST MODEL (MOVEC): MODEL DESCRIPTION AND ILLUSTRATIVE APPLICATIONS. *Rand Corp., Santa Monica, Calif., Environmental Protection Agency Grant 6704-0270-E, R-1364-SD/Appendix 2, 101p., Dec. 1973. 47 refs.*

NTIS: N74-31089

The Motor Vehicle Emission and Cost Model (MOVEC) was developed and used primarily for evaluating light-duty motor vehicle (LDMV) retrofit and inspection/maintenance (retrofit-I/M) strategies. For a specific retrofit-I/M strategy in a specific calendar year, MOVEC calculates the LDMV emissions for all species, the total annualized costs (both purchase and operating) to the region, and the distribution of costs by income group under three alternative payment schemes for financing the retrofit-I/M strategy. The model considers the effect of average trip speed on emissions. When emissions from other sources and the allowable regional emissions are specified, MOVEC estimates the LDMV mileage reductions necessary (if any) to meet the air quality standard for each species. (Author summary modified)

51167 APTIC NO. 70227

Willis, Bryon H.

HACKENSACK MEADOWLANDS AIR POLLUTION STUDY-EVALUATION AND RANKING OF LAND USE PLANS (FINAL REPORT). *Environmental Research and Tech., Inc., Lexington, Mass., Environmental Protection Agency Contract EHSD 71-39, EPA-450/3-74-056-d, ERT Proj. P-244-3, 283p., Nov. 1973. 28 refs.*

NTIS: PB 238606/AS

Procedures for incorporating air pollution considerations into the formulation and evaluation of alternative urban land use and transportation system plans and policies were developed. Procedures were demonstrated through application to the evaluation and ranking of the 1990 comprehensive land use plans for the New Jersey Hackensack Meadowland Region. Planning agencies were surveyed to determine the extent to which air pollution considerations are included in the planning process. Methodologies were developed to permit planners to assess the air pollution impact associated with land use plans and to permit planners to rank and evaluate alternative land use plans in terms of air quality criteria. The regional air quality impact associated with the four alternative land use plans for the Hackensack Meadowlands for the 1990 time period is analyzed. (Author summary modified)

51168 APTIC NO. 70529

Japan Environmental Agency, Div. of Air Pollution Control

ANNUAL REPORT ON AIR POLLUTION CAUSED BY PHOTOCHEMICAL REACTIONS; DAMAGE REPORT AND EMERGENCY ISSUE IN 1973. *(Kokagaku Hanno ni yoru taiki osen kankei shiryo; Kinkyu hatsurei jokyo, higai todoke jokyo). Text in Japanese. 48p., Dec. 1973.*

The data on issuance of oxidant emergency alerts and registered damage complaints due to photochemical air pollution during the period of April to October 1973 reported by prefectural governments are compiled. The data on frequency of oxidant emergency alerts issued in 21 prefectures from 1970 to 1973, monthly variations in frequency of emergency alerts issued in 1973, number of afflicted people registered from 1970 to 1973, monthly variations in number of afflicted people in 1973, classification of afflicted people, and number of days when more than 300 people were afflicted are compiled, classified, and analyzed along with some case studies. The excerpt of the emergency control measures taken by means of issuing the forecasting, warning, alert and emergency alert are given; and the status of the air pollution monitoring system is discussed.

1972

51169 APTIC NO. 70563

Japan Environment Agency

POLLUTION RELATED DISEASES AND RELIEF MEASURES IN JAPAN. *35p., May 1972.*

Air pollution diseases and a system to provide medical allowances and benefits to victims are discussed. The diseases which may be both caused and aggravated by air pollution include chronic bronchitis, bronchial asthma, pulmonary emphysema, asthmatic bronchitis, and their complications. Relief for patients started in Yokkaichi City in May 1965. The Law concerning Special Measures for the Relief of the Pollution related patients, promulgated in Dec. 1969, transferred services that require nationwide uniform relief from the local authorities to the central government. Medical allowances and other relief were provided by the government under this Law since Feb. 1970. Upon application from a person with a designated disease who has lived in a designated area for a prescribed period of time, or is commuting to the area, the local Mayor makes the final decision whether to recognize the applicant as an officially designated patient, subsequent to hearing the opinions of the medical experts on the Pollution Victim Verification Committee. The designated patients are provided with medical expenses and allowances, including necessary transportation expenses, while they are receiving treatment for the designated disease. Minamota and Itai-itai diseases caused by mercury and cadmium water pollution, respectively, are also discussed.

1971

51170 APTIC NO. 72972

Ayres, Richard, Julie Copeland, and James Miller

ACTION FOR CLEAN AIR: A MANUAL FOR CITIZEN PARTICIPATION IN STATE IMPLEMENTATION PLAN PROCEEDINGS UNDER THE CLEAN AIR AMENDMENTS OF 1970. *New York, Natural Resources Defense Council, Inc., 77p., 1971. 15 refs.*

A manual for assisting citizen participation in state implementation plan proceedins is presented. Sections of the amended Clean Air Act that are of immediate concern to clean air groups are described along with important deadlines set by the Act. Ways for citizens to influence state implementation plans and legal responses to inadequate plans and unwarranted exemptions are also discussed. Each element of an implementation plan required by the Act is treated as well as variances and exemptions allowed by the Act and Federal guidelines. Sources of literature pertaining to air quality and its control and example regulations for implementation plans are provided in appendices.

GENERAL

1974

51171 ***APTIC NO. 70431***

Burkhardt, Ingrid, Ursula Rahlenbeck, Lieselotte Domagalski, and Dieter Giesen

NITROGEN OXIDES. BIBLIOGRAPHY (1970-1974). (Sickstoffoxide. Bibliographie (1970-1974)). VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft, 123p., Sept. 1974. 515 refs.

An annotated bibliography of literature from 1970-1974 pertaining to nitrogen oxides is presented. Topics covered in the 515 works cited include: the measurement and mathematical prediction of NOx concentrations; nitric oxide reduction of ozone; chemical reactions involving NOx; the control of NOx from industrial, non-industrial, and transportation sources; NOx dispersion; the role of NOx in photochemical smog formation; the effects of NOx on human health; plant and animal exposure studies; air quality criteria and standards for NOx; NOx monitoring networks throughout the world; and meteorological effects on NOx reactions in the atmosphere. The bibliography is indexed both by author and by subject and provides citations and abstracts in their original language.

51172 **APTIC NO. 70671**

Giuliani, Gino, Maria Nives Battiston, and Luciano Brambilla

CRITICAL CONDITIONS FOR STACK CENTRALIZATION IN INDUSTRIAL COMPLEXES. *Termotecnica (Milan), 28(10):551-556, 1974. 3 refs.*

A method for evaluating conditions necessitating the centralization of all flue gases from industrial complexes with multiple sources into a single stack is presented. The sulfur dioxide emissions of combustion plants are emphasized. The relationship between sulfur concentrations in fuel and thermal loads when the plant location is established is discussed. The central stack is the only way to obtain the ground level pollutant concentration required by law for a given value of the sulfur concentration in the fuel/thermal load ratio. The critical ratio of sulfur concentration/heat loads above which emission centralization into a single stack of appropriate height becomes necessary is calculated for two examples. (Author abstract modified)

1972

51173 **APTIC NO. 66750**

Flower, Franklin B.

EFFECTS OF AIR POLLUTION ON THE ENVIRONMENT. *In: Air Pollution and Industry, R. D. Ross (ed.), New York, Van Nostrand Reinhold Co., 1972, Chapt. 2, p. 18-78. 194 refs.*

The effects of air pollution on the environment are reviewed with particular emphasis on mechanism of cause-and-effect relationships and socioeconomic implications. Topics discussed include: air pollution effects on materials deterioration; acute and chronic effects on human health, with particular reference to specific industrial emissions; pollution effects on animals and vegetation; and meteorological implications involving global air temperature and urban effects on fog, precipitation, solar radiation, and visibility, with a relationship being given for the effect of atmospheric particulate loadings on visibility. Types of pollutants examined include: metallic and nonmetallic particulates, sulfur oxides, photochemical oxidants, pollens, aldehydes, ammonia, nitrogen oxides, aliphatic and aromatic hydrocarbons, asbestos, carcinogens, pesticides, odorous compounds, inorganic acids, chlorine gas, radioactive substances, carbon monoxide and carbon dioxide, hydrogen sulfide, fluorides, ozone, and peroxyacetyl nitrate.

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